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POLLUTION OF THE INTERSTATE WATERS OF MOUNT HOPE BAY AND ITS TRIBUTARIES IN THE STATES OF MASSACHUSETTS AND RHODE ISLAND. PROCEEDINGS OF CONFERENCE HELD AT PROVIDENCE, RHODE ISLAND ON DECEMBER 7, 1971. VOLUME 1

Environmental Protection Agency
Washington, D. C.

7 December 1971

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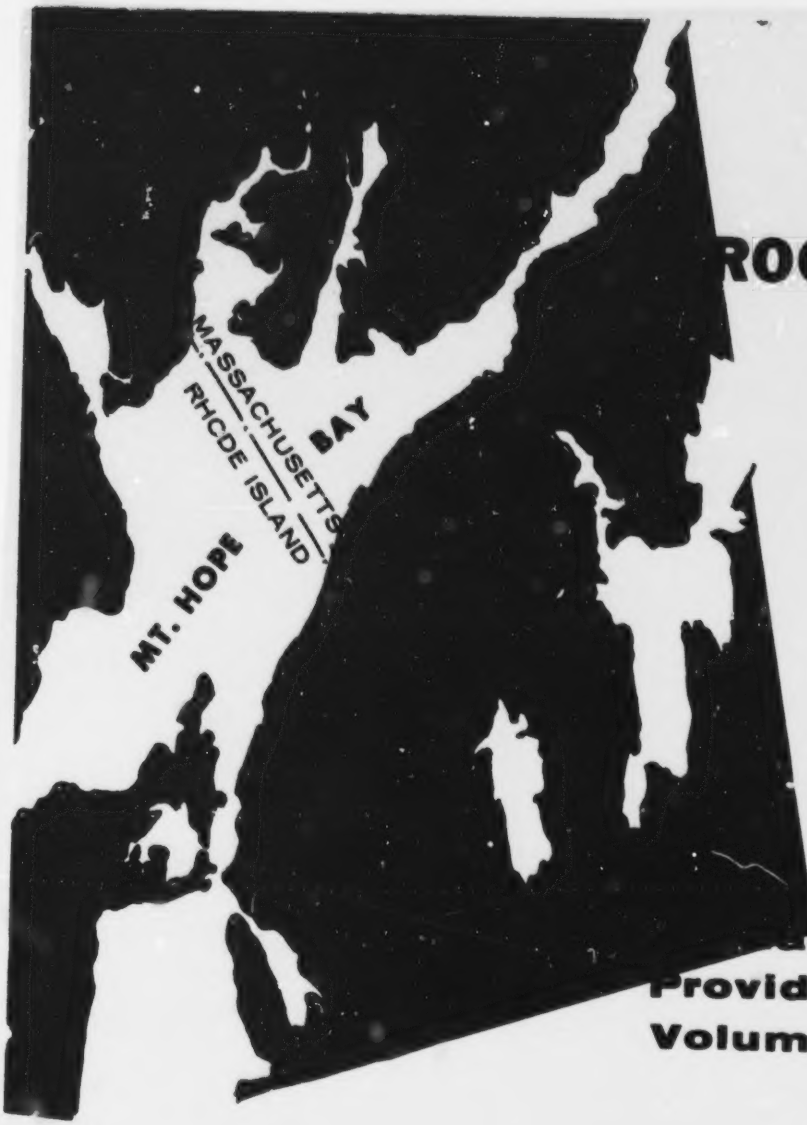
MASSACHUSETTS
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MT. HOPE

ROCEEDINGS

nber 7, 1971
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Providence, Rhode Island
Volume 1

CONFERENCE

In the Matter of Pollution of the Interstate Waters of Mount Hope Bay and its Tributaries in the States of Massachusetts and Rhode Island.

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CONFERENCE

IN THE MATTER OF POLLUTION OF THE INTERSTATE WATERS OF MOUNT HOPE BAY AND ITS TRIBUTARIES IN THE STATES OF MASSACHUSETTS AND RHODE ISLAND

Biltmore Hotel
Providence, Rhode Island

Tuesday, December 7, 1971

CONTENTS

Page

Opening Statement - Murray Stein 11

Hon. Claiborne Pell
(presented by Mr. Lynch) 18

Fitzhugh Green 22

Hon. Charles H. W. Foster 33

Myron O. Knudson 43

Charles Corkin, II 275

William Michael Kemp 286

Darrell Schwalm 289

Carleton A. Maine 311

Gloria Ann Fry 318

Donald R. Corey 329

Carl G. Hart 345

John Elwood 346

Philip H. R. Cahill 357

Thomas C. McMahon 362

Francis L. Kelly 370

William E. Barbour 382

Dr. James W. Holt 384

Chandler W. Johnson 387

Conference in the Matter of Pollution of the Interstate Waters of Mount Hope Bay and its Tributaries in the States of Massachusetts and Rhode Island, held at the Biltmore Hotel, Providence, Rhode Island, on December 7, 1971, at 9:50 a.m.

PRESIDING:

Murray Stein, Chief Enforcement Officer - Water, Environmental Protection Agency, Washington, D. C.

CONFEREES:

Thomas C. McMahon, Director, Division of Water Pollution Control, Department of Natural Resources, Commonwealth of Massachusetts, Boston, Massachusetts

Alfred F. Ferullo, Environmental Bioengineer, Division of Water Pollution Control, Department of Natural Resources, Commonwealth of Massachusetts, Boston, Massachusetts

Walter J. Shea, Assistant Director, Rhode Island Department of Health, Providence, Rhode Island

Alfred E. Peloquin, Executive Secretary, New England Interstate Water Pollution Control Commission, Boston, Massachusetts

John A. S. McGlennon, Regional Administrator, Environmental Protection Agency, Region I, Boston, Massachusetts

Herbert R. Pahren, Director, Enforcement Division, Environmental Protection Agency, Region I, Boston, Massachusetts

PARTICIPANTS:

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P. H. R. Cahill, Assistant General Counsel, New England Power Company, Westboro, Massachusetts

Donald Corey, Massachusetts Division of Water Pollution Control, Boston, Massachusetts

Charles Corkin, II, Environmental Protection Agency, Region I, Boston, Massachusetts

John Elwood, Massachusetts Division of Water Pollution Control, Boston, Massachusetts

Frank Fogarty, Chief, Operations Division, U. S. Army Engineers, Waltham, Massachusetts

Charles H. W. Foster, Massachusetts Secretary of Environmental Affairs, Boston, Massachusetts

Gloria Ann Fry, Massachusetts Division of Water Pollution Control, Boston, Massachusetts

Fitzhugh Green, Associate Administrator, Environmental Protection Agency, Washington, D.C.

Carl G. Hart, Chairman, Ecological Advisory Group, U. S. Army Corps of Engineers, Waltham, Massachusetts

Dr. James W. Holt, Save the Bay, Tiverton, R.I.

Chandler W. Johnson, P. O. Box 932, Annex Station, Providence, Rhode Island

Francis L. Kelly, Committee for the Protection Of the Lee River Environment, Swansea, Massachusetts

William Michael Kemp, Sanitary Engineer, EPA, Region I, Needham, Massachusetts

Myron O. Knudson, Chief, Surveillance Branch, Environmental Protection Agency, Region I, Needham Heights, Massachusetts

PARTICIPANTS (continued):

William J. Lynch, Administrative Aide to United States Senator Claiborne Pell, Washington, D. C.

Carleton A. Maine, Chief, Rhode Island Department of Health, Providence, Rhode Island

Darrell Schwalm, Regional Shellfish Consultant, U. S. Public Health Service, Food and Drug Administration, Boston, Massachusetts

ATTENDEES:

Kerry Anderson, EPA, Needham, Massachusetts

Jean Baneroff, East Freetown, Massachusetts

S. Gail Battista, Editor, BNA "Environment Reporter," Washington, D. C.

Lawrence Bertman, Vice President, Durfee Fuels, Inc., Fall River, Massachusetts

William A. Birona, Information Center Manager, University of Rhode Island, Narragansett, R. I.

John Buckley, Vice President, Northeast Petroleum, Chelsea, Massachusetts

Mrs. Janice Burrows, The Committee for the Protection of the Lee River Environment, Swansea, Massachusetts

ATTENDEES (continued):

Robert D. Burrows, The Committee for the Protection of the Lee River Environment, Swansea, Massachusetts

Robert Campbell, Marine Biologist, USPHS, FDA, Shellfish Sanitation, Davisville, R. I.

G. John Canulla, Vice President, Save the Bay, Tiverton, Rhode Island

C. John Capone, P. E., City of Fall River, Mass.

Steven Carlson, Student, Brown University, Providence, Rhode Island

Augustus Charos, Ocean Data Equipment Corporation, East Providence, Rhode Island

Curtis Chase, Fall River, Massachusetts

Ben C. Clough, Providence, Rhode Island

Gordon E. Como, Jr., N.R.O., Massachusetts Southeast District

Edward Conley, EPA, New England

Alan N. Cooperman, Associate Sanitary Engineer, Massachusetts Division of Water Pollution Control, Boston, Massachusetts

Anna Cote, Concerned Citizens of the South End of Fall River, Fall River, Massachusetts

Geraldine V. Cox, Ph.D., Director, Environmental Chemistry, Portsmouth, Rhode Island

David Crestin, Biologist, Fish & Wildlife Service, Boston, Massachusetts

Raymond Cross, Engineering Design Manager, ICI America Inc., Stamford, Connecticut

ATTENDEES (continued):

Kenneth Crotty, Director, Public Affairs Office, EPA, Boston, Massachusetts

Elizabeth Doherty, Apponequet Ecology Group, Assonet, Rhode Island

Robert S. Dorsey, Advisor, Apponequet Regional High School, East Freetown, Massachusetts

Roger F. Dunart, Sanitary Engineer, EPA, Needham, Massachusetts

James N. Dunbar, News Reporter, The Fall River Herald News, Fall River, Massachusetts

Gilbert Fain, Staff Consultant, ODEC, East Providence, Rhode Island

Levi Fears, Reporter, WPRI-TV, Channel 12, Providence, Rhode Island

Brad Field, Apponequet Regional High School, East Freetown, Massachusetts

Edward Fitzpatrick, EPA, Needham, Massachusetts

Matthew J. Flanagan, Resident Manager, Tippetts, Abbett, McCarthy, Stratton, Fall River, Mass.

Robert Frederikson, Reporter, Providence Journal, Providence, Rhode Island

Santo A. Furfari, Sanitary Engineer, USPHS, FDA, Shellfish Sanitation, Davisville, R. I.

Wilfrid L. Gates, Jr., Rhode Island Department of Transportation, Providence, Rhode Island

Clarence Gaudette, Blackstone Watershed, Cumberland, Rhode Island

Jeffrey E. Gould, Sanitary Engineer, Massachusetts Water Pollution Control, Pembroke, Massachusetts

Michael R. Deland, Attorney, EPA, Boston, Massachusetts

ATTENDEES (continued):

Clement Griscom, Napatree Point Conservation Comm., Watch Hill, Rhode Island

Paul T. Hicks, Executive Director, Rhode Island Petroleum Association, Providence, Rhode Island

Robert M. Huey, Bristol, Rhode Island

Walter Hundley, Engineer, Chas. A. McGuire & Associates, Providence, Rhode Island

Caroline Isber, Congressional Aide, Congresswoman Margaret Heckler, Wellesley, Massachusetts

Brian L. Jeans, Senior Sanitary Engineer, Massachusetts Water Pollution Control, Pembroke, Massachusetts

Edward E. Johanson, Vice President, JBF Scientific, Burlington, Massachusetts

Marlene A. Johnston, Salve Regina College, Newport, Rhode Island

James B. Joyce, Plant Supervisor, Gulf Oil Company, State Avenue, North Tiverton, R. I.

Steven Kalter, Brown University, Providence, R. I.

Stanley W. Karnasiewicz, Executive Director, Concerned Citizens of South End Fall River, 87 Bayview Street, Fall River, Massachusetts

Dodie Kazanjian, Salve Regina College, Newport, R. I.

Paul Keough, Public Affairs, EPA, Boston, Massachusetts

A. Harris Kenyon, Deputy Director, Field Liaison, EPA, Washington, D. C.

Lester M. Klashman, Deputy Regional Administrator, EPA, Region I, Boston, Massachusetts

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Kathleen Koss, Assistant Librarian,
Southeastern Regional Planning & Economic
Development District, 68 Winthrop Street,
Taunton, Massachusetts

A. A. LaFrance, Production Manager, Great Lakes
Dredge & Dock Company, Union, New Jersey

Robert J. Leger, Marine Biologist, U. S. Army
Corps of Engineers, Waltham, Massachusetts

Richard J. Logue, Lt. Cdr., U.S.N., Assist.
Operations, Naval Base/Naval Station,
Newport, Rhode Island

Jeff Leonard, Newsman, WSAR-Radio, Home Street,
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Taunton Sewer Department, Taunton, Massachusetts

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P. O. Box 415, North Dighton, Massachusetts

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Assonet, Massachusetts

Anderson J. Newman, Rich, May & Bilodeau,
One State Street, Boston, Massachusetts

Arthur Norwalk, Reporter, WJAR-TV, Providence, R.I.

Arthur H. Noble, ICI America, Inc.,
Dighton, Massachusetts

Bill Northrup, WPRO News Reporter, Providence, R.I.

Pam Osborne, Apponequet Ecology Group,
Lakeville, Massachusetts

ATTENDEES (continued):

Micholas Pagliaro, Supervising Auditor,
U. S. General Accounting Office, Boston, Massachusetts

Dr. A. C. Perrino, Assistant Works Manager,
ICI America, Inc., Dighton, Massachusetts

David Pickman, Assistant Administrator for
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EPA, Region I, Boston, Massachusetts

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Power Company, Westboro, Massachusetts

Alonzo W. Quinn, Professor Emeritus, Brown
University, Providence, Rhode Island

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Stamford, Connecticut

James K. Rogers, Manager Environmental Quality,
Raytheon Company, Executive Offices, Lexington,
Massachusetts

Barbara P. Rosing, Program Advisor, EPA,
Region I, Boston, Massachusetts

David M. Rosser, Executive Director, Blackstone
River Watershed Association, Pawtucket, R. I.

John E. Salo, Senior Sanitary Engineer,
Massachusetts Division of Water Pollution Control,
Boston, Massachusetts

ATTENDEES (continued):

John T. Scanlon, Executive Director, Save the Bay, Inc., E. Greenwich, R. I.

Ronald C. Shufrin, NEIWPCC Staff, 607 Boylston Street, Boston, Massachusetts

Bernard P. Skulte, Environmental Engineers, Commandant, First Naval District, Boston, Massachusetts

K. C. Sokolosky, Jr., Assistant to the President, Narragansett Electric Company

Reinhold W. Thieme, Special Assistant, Water Enforcement, EPA, Washington, D. C.

William J. Torpey, General Manager, Fall River Port Authority, Fall River, Massachusetts

Howard Ulman, Newsman, Associated Press, Providence, Rhode Island

Frank A. Valas, New England Electric System, Westboro, Massachusetts

Edgar E. Vallee, Agent, Curran-Burton, Division of Texaco, Tiverton, Rhode Island

PROCEEDINGS

OPENING STATEMENT
BY MURRAY STEIN
CHIEF ENFORCEMENT OFFICER - WATER
ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D. C.

MR. STEIN: The conference is open.

This conference in the matter of pollution of the interstate waters of Mount Hope Bay and its tributaries in the States of Massachusetts and Rhode Island is being held under the provisions of section 10 of the Federal Water Pollution Control Act, as amended. Under the provisions of the Federal Act, the Administrator of the Environmental Protection Agency is authorized to initiate a conference of this type when on the basis of reports, surveys, or studies he has reason to believe that pollution subject to abatement under the Federal Act is occurring.

As specified in section 10 of the Act, the official State and interstate water pollution control agencies have been notified of this conference by Administrator William Ruckelshaus. These agencies are the Massachusetts Department of Natural Resources, the

Rhode Island Department of Health, and the New England Interstate Water Pollution Control Commission.

Both the State and Federal governments have responsibilities in dealing with water pollution control problems. The Federal Water Pollution Control Act declares that the States have primary rights and responsibilities for taking action to abate and control pollution. Consistent with this, the Federal Government is charged by law to encourage the States in these activities.

At the same time, the Administrator of the Environmental Protection Agency is charged by law with specific responsibilities in the field of water pollution control in connection with pollution of interstate and navigable waters. The Federal Water Pollution Control Act provides that pollution of interstate or navigable waters which endangers the health or welfare of any persons shall be subject to abatement. This applies whether the matter causing or contributing to the pollution is discharged directly into such waters or reaches such waters after discharge into a tributary.

The purpose of the conference is to bring together the State and interstate water pollution control agencies, representatives of the U. S. Environmental

Protection Agency, and other interested parties to review the existing situation, and the progress which has been made, to lay a basis for future action by all parties concerned, and to give the States, localities, and industries an opportunity to take any indicated remedial action under State and local law.

I think some of you who have not been at conferences will find that situations have existed before we had the conference, of course, and the State and interstate agencies as well as the Federal Government have been carrying on certain activities. Not a small measure of the problems to be faced by this conference and of our accomplishments will be meshing together these existing State, interstate and Federal activities and seeing where we go from here.

The purpose of this is trying to get us all on the same track and seeing if we can come up with compatible programs.

I would like the conferees now to identify themselves. Can we start with you, Mr. Peloquin?

MR. PELOQUIN: Alfred E. Peloquin, Executive Secretary of the New England Interstate Water Pollution Control Commission.

MR. SHEA: Walter Shea, Assistant Director, Rhode Island Department of Health.

MR. PAHREN: Herbert Pahren, Director, Enforcement Division for Region I, EPA.

MR. McGLENNON: John McGlennon, Regional Administrator, EPA.

MR. McMAHON: Thomas McMahon, Director of the Division of Water Pollution Control, Department of Natural Resources, Commonwealth of Massachusetts.

MR. FERULLO: Alfred F. Ferullo, Environmental Bioengineer, Massachusetts Division of Water Pollution Control.

MR. STEIN: My name is Murray Stein. I am the Chief Enforcement Officer for Water for the Environmental Protection Agency, Washington, D. C., and the representative of Administrator Ruckelshaus.

The parties to the conference are the official State and interstate water pollution control agencies and the Environmental Protection Agency. These are all represented at this head table here. Participation in the conference will be open to representatives and invitees of these agencies and such persons as inform me that they wish to present statements. However, only the representatives of the official agencies constitute the conferees.

Now a word about the procedures governing the conduct of the conference. The conferees will be called upon to make statements. The conferees, in addition, may call upon participants whom they have invited to the conference to make statements. In addition, we shall call on other interested individuals who wish to present statements.

At the conclusion of each statement, the conferees will be given an opportunity to comment or ask questions, and I also may ask a question or two. This procedure has proven effective in the past in reaching equitable solutions.

Although we cannot entertain questions or comments from the floor, you can be assured that everyone will have an opportunity to be heard fully. Please save your comments and questions, and we will give you an opportunity to make these points when your turn comes to speak.

At the end of all the statements, we shall have a discussion among the conferees and try to arrive at a basis of agreement on the facts of the situation. Then we will attempt to summarize the conference orally, giving the conferees, of course, the right to amend or modify the summary.

Under the Federal law, the Administrator of the Environmental Protection Agency is required at the conclusion of the conference to prepare a summary of it which will be sent to the conferees. The summary -- and I would like to emphasize this -- according to law must include the following points. These are the points that the conferees must take up. Of course, they can take up any others they wish.

1. The occurrence of pollution of interstate waters subject to abatement under the Federal Act;

2. Adequacy of measures taken toward abatement of pollution; and

3. Nature of delays, if any, being encountered in abating the pollution.

The Administrator is also required to make recommendations for remedial action if such recommendations are indicated. Generally, if this is the case, the conferees make these recommendations, and they are forwarded to the Administrator for his consideration.

A record and verbatim transcript of the conference is being made by Mr. Joe McLaughlin. This is being made for the purpose of aiding us in preparing a summary and also for providing a complete record of what is said here.

It usually takes about 3 or 4 months for a transcript to come out in printed form, but if you wish a record or part of a record beforehand you can check with Mr. McLaughlin, who is an independent contractor, and make your own arrangement with him.

I would like to point out that we do not print in color, so please take that into account. Any charts you may present will be done in black and white. Try not to refer to color if you use graphic aids in your presentation as they may be meaningless when the transcript is read.

We will make copies of the summary and transcript available to the official State and interstate water pollution control agencies. We have generally found that for the purpose of maintaining relationships within the States the people who wish summaries and transcripts should request them through their State agency rather than come directly to the Federal Government. The reason for this is that, when the conference has been concluded, we would prefer people who are interested in the problem to follow the normal relationships in dealing with the State agencies rather than with the Federal Government. This has worked successfully in the past, and we will be most happy to make this material available for distribution.

I would suggest that all speakers and participants other than the conferees making statements come to the lectern and identify themselves for purposes of the record.

Now we would like to call on Mr. William J. Lynch, Administrative Aide to United States Senator Claiborne Pell.

Mr. Lynch.

STATEMENT OF

HON. CLAIBORNE PELL

U. S. SENATE

WASHINGTON, D. C.

(Presented by William J. Lynch,

Administrative Aide)

MR. LYNCH: My name is William J. Lynch. I am an administrative aide to Senator Claiborne Pell. I am sure all of us understand that both houses in the Congress are striving desperately to adjourn this first session of the 92nd Congress. Consequently, with the permission of the chairman, Murray Stein, who has permitted the Senator to submit this statement, I have been given the honor and the privilege of reading it today.

This is a statement by Senator Claiborne Pell to the enforcement conference on pollution in Mount Hope

Bay, Providence, Rhode Island, December 7 and 8, 1971.

Mr. Chairman, thank you for the opportunity to address this enforcement conference. My remarks will be brief.

I am sure that many differences of opinion will be expressed by the various individuals and organizations that speak during these 2 days. Yet I am equally sure that they all share at least some recognition of the seriousness of the pollution problem in Mount Hope Bay and a determination to solve that problem.

I have always believed that we in Rhode Island have no more precious natural resource than our miles of coastline and waterways. Some years ago I proposed that Rhode Island identify itself as "The Ocean State" in recognition of our dependence on this vital resource. I am glad that our General Assembly has adopted this idea.

It appears now that history has placed on our shoulders the vital decision of either preserving this resource or allowing it to be squandered away, a tragic waste which could never be corrected.

It is easy to answer, "Of course, we must preserve our environment." But many hard and unpleasant decisions immediately follow. All of us, individuals, taxpayers, State and local governments, Federal Agencies, and private industries must be willing to pay the steep costs of controlling and eventually eliminating the scourge of water pollution.

The Congress has taken some important steps toward aiding in this fight, though I recognize that there is much more that we must do. The fact that this enforcement conference is being held by the Environmental Protection Agency is an outgrowth of the Federal Water Pollution Control Act of 1965.

Just a month ago the Senate passed amendments to that Act which, for the first time, will provide a program on the Federal level which has enough teeth to tackle this problem. I am dismayed that there are attempts in the House of Representatives to weaken this program. My fervent hope is that those efforts will be unsuccessful.

Mr. Chairman, much of the Federal effort is pointed toward enforcement, which is the aim of this conference and a very important element in any attack on an environmental problem.

But huge amounts of Federal, State, and local funds and the most stringent enforcement will not be enough to lick this problem. Mr. Chairman, what we must have is cooperation on all levels: between the Federal and State governments; between the States, such as Rhode

Island and Massachusetts; between the State and the communities; and among the communities themselves. And, most important, we need the cooperation of all industries and private citizens with all these levels of government.

All of these elements are represented at this conference. For that reason it provides an ideal opportunity for a determined start toward gaining this cooperation. I believe that once the seriousness of the pollution problem in Mount Hope Bay is painted in the most accurate terms, as I hope it will be during this conference, then voluntary cooperation will follow.

Mr. Chairman, let me assure all of the various groups participating during these 2 days that I am prepared to lend all my efforts to aid in helping them in a cooperative effort to clean up Mount Hope Bay.

Again, thank you very much for this opportunity to express my views.

Thank you, Mr. Chairman.

MR. STEIN: Thank you, Mr. Lynch, for a very excellent statement. We have always been appreciative of the support we have gotten from the Senator in this program through the years.

I think part of the statement really goes to the heart of what we are going to do at the conference. On the basis of long experience with these problems, I am of the firm conviction -- and I think this was reflected in the Senator's statement -- that if we can accurately describe the problem and what is happening, the solution almost presents itself.

Next we would like to hear from Mr. Fitzhugh Green of the Environmental Protection Agency.

Mr. Green.

STATEMENT OF

FITZHUGH GREEN

ASSOCIATE ADMINISTRATOR

ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON, D. C.

MR. GREEN: Good morning, ladies and gentlemen.

Before I give you my remarks let me take you for just a minute back to the time of Caesar and the Bay of Naples -- before that beautiful bay became polluted by oil spills. The scene is on board an old Roman galley -- 300 slaves glistening with sweat in the belly of the ship.

And the slavemaster gets up on the poopdeck and he looks down and says to them, "Slaves, I've got good news for you and bad news."

He said, "The good news is that the captain is so pleased with the way you rowed him down from Rome this afternoon that he has ordered you have meat in your soup and an extra ration of grog for your supper."

Everybody cheered.

He said, "Wait a minute, slaves. I told you I had some bad news too. The bad news is that after supper the captain wants to go water skiing."

(Laughter)

The bad news here, of course, is that Mount Hope Bay is a pit of bad water. Driving around the bay this morning and seeing the Ocean State sign, I thought that we are getting very close to being called the "dirty ocean State."

The good news, of course, is that we are going to do something about it through this conference and what happens afterwards.

Do you remember the old story -- it's an old, old story -- about the New England family that had two sons? Once of them ran away to sea, and the other one became Vice President -- and neither was ever heard from again.

(Laughter)

If a New England son went off to Washington to save the environment of this Nation, even until recently, he could have expected the same fate. But not anymore. The United States Environmental Protection Agency, which celebrated its first birthday this last Thursday, refuses to stay bureaucratically hidden in Washington.

Our Administrator, William D. Ruckelshaus, insists that the heart of the Agency lies not in Washington but in the States where the endangerment of the environment is going on. Mr. Ruckelshaus has shown that he will not sit in his armchair in his office in Washington and look for scapegoats, but, rather, he is looking around the country for partners to help him stop the pollution. That is what we are doing here in Providence today.

Together with the Rhode Island Department of Health, the Massachusetts Department of Natural Resources, and the New England Interstate Water Pollution Control Commission we are searching for more information on how best to rescue Mount Hope Bay. This excellent professional report which was prepared by Mr. John McGlennon's office reveals the sorry details about what is happening to the bay.

Mr. McGlennon is EPA's Regional Administrator for New England. Under President Nixon's plan to return the central government to the people, EPA has 10 such regional offices around the country. Each office is a more or less exact facsimile of EPA, Washington, with a regional administrator in charge representing Mr. Ruckelshaus.

Your chairman in this conference, Murray Stein, ranks as a nationally known expert in water pollution control. Last week EPA gave him a silver medal for his outstanding services. He doesn't have the medal on because we didn't really give it to him yet, because we are so young that we have just put a crest on such things and the crest has to be cast.

We understand it is coming up here shortly, Murray -- especially if this conference succeeds.

(Laughter)

MR. STEIN: Fine.

MR. GREEN: I personally am delighted to be part of this important conference to save Mount Hope Bay. As a New Englander I am gratified that Washington up here working through the Massachusetts and Rhode Island environmental officials -- and they are all distinguished experts in this field -- is impacting specifically on this terrible problem that is afflicting our lovely and historic region.

Of course, as a Rhode Islander I am aware that 80 percent of the contaminants in Mount Hope Bay are due to the activities of our friendly Massachusetts neighbors. But we are confident that this conference will contribute solutions to some of the many difficulties that have developed, for example, from the expansion of the Brayton Point power facility. This, as you know, has wrought severe degradation of both air and water in the Mount Hope area.

You might also like to know that the Environmental Protection Agency has asked the regional office to treat this study of Mount Hope Bay as the first step toward correcting the quality of the entire Narragansett Bay. In fact, Mr. McGlennon's staff plans to carefully scrutinize other continuing sources of pollution.

You can take the proposed nuclear powerplant at Rome Point as a potential source of this kind. We are already concerned over its possible environmental threat.

We realize that certain other sections around Narragansett Bay have had some controversy over EPA's attempts to bring secondary treatment to the urban sewage. We will persist through Mr. McGlennon to find a fair resolution of this disagreement with the town, county, and State representatives. But I must emphasize that only by insisting on secondary treatment will we ever restore Narragansett Bay to its natural state of beauty and purity.

Incidentally, in Rhode Island, EPA has two laboratories down in South County. One of them is the Water Quality Laboratory in Kingston which is headed up by Dr. Tarzwell. In fact, Dr. Tarzwell and I testified before Senator Pell in the Senate last spring on Dr. Tarzwell's finding that shellfish indeed do suffer very badly from oil spills when the oil sinks to the bottom of the water, to the ocean bed.

The other laboratory is the Water Hygiene Laboratory which is located on the Narragansett Bay campus of the University of Rhode Island. And I can't mention URI without throwing a salute to the fine work that has been done over the past years by Dr. John Knauss, who is the Dean of the Graduate School of Oceanography at URI, and Dr. Nils Rohrholm.

Before turning this meeting back to Murray Stein, I would like to tell you a bit more about EPA, what we are, what we are trying to do, what we have done to date, and what we think our ultimate hopes for success are.

President Nixon created the Agency last year by Executive order, with the tacit consent of Congress.

In order to conserve the national biosphere in a more integrated fashion, the President put together 15 ongoing Federal programs and turned them over to Mr. Ruckelshaus.

In February this year the President then submitted a large package of suggested legislation to strengthen and refine EPA's ability to carry out its mission.

Mr. Ruckelshaus and his new organization have had a busy first year -- as busy, you might say, as a one-legged chorus girl. He has completely reorganized the more than 5,000 people assigned to him. He is now in the process of increasing this number to about 9,000, and the budget has jumped from $1.5 to $2.4 billion.

The laws that we are administering cover the need to do something about the problems of pollution in the air, the water, pesticides, persistent pesticides, solid waste disposal, radiation, and now noise.

We have published criteria, established standards, monitored and enforced them, and all this while conducting extensive research and technology transfer programs to help industry and local governments meet these standards. Mr. Ruckelshaus has likened this rigorous experience to trying to run a 100-yard dash while undergoing an appendectomy.

We are in the middle of a campaign to close down 5,000 obsolete dumps in hundreds of communities across the land.

We are developing an incinerator whose combustion gases can be used to generate electricity.

We are demonstrating a revolutionary new mechanism that can separate glass, paper, and metal in municipal waste and prepare them for recycling.

Speaking of glass, our Solid Waste Disposal Division is concerned about the terrible problem of used bottles, glass bottles, and is experimenting with water-soluble glass. We have a few that look just like this (indicating).

You may wonder how you can put water into a water-soluble glass. The trick is to spray it with a substance that lasts as long as the glass does, or the bottle.

I had a sample which I was going to bring up, but I absentmindedly put it in my dishwasher yesterday -- so I'm sorry I don't have it.

(Laughter)

In EPA's brief span we have formulated and issued the most stringent air quality standards in the history of America. We have begun to enforce the long idle

Refuse Act of 1899. We have been concerned about the environment for a long time but not concerned enough.

Under this Act, which Chairman Stein has already mentioned, we have put a requirement on 40,000 industrial firms in this country to ask for permits before they go on dumping waste effluent into the navigable waters of the country, the inland waters.

We have started out or reactivated 14 critical Federal water enforcement conferences like the one that you are attending today. We have also initiated or participated in 188 lawsuits to compel compliance with water pollution laws.

There are quite a few places around this country where we are being criticized for being too vigorous in our enforcement efforts. As Mr. Ruckelshaus said the other day, when he considers the enormous power behind this new Agency he is amazed at his own moderation in enforcing it.

Only a few days ago we brought injunctions against 16 firms down in Birmingham, Alabama, which you probably read about. They were raising the air pollution level to a very, very dangerous stage.

Now, what about the future? Frankly, we are optimistic -- one reason being that the abatement schedules, pollution abatement schedules, in effect right now are being effective.

A good example you can all see is next time you hear a jet airplane go over, look up at it. The chances are you will see that one of the jets is pouring out, as usual, the black kerosene, unburned kerosene, and probably you can't see anything coming out of the other jet.

This is part of our progressive enforcement schedule. And, hopefully, next year when you look up in the sky, you won't see black smoke coming out of either jet or any of the jets, depending on the size of the plane.

Another reason that we are optimistic about the future is that private accomplishments in the past have been very encouraging. In fact, individuals and communities have proved quite effective in many sections of the country in taking matters into their own hands. There are some really dramatic success stories. I will tell you two or three of them.

One is in Seattle, where their real recreational pride, Lake Washington, became so fouled that it was no longer possible to fish or boat or swim in it. Instead of waiting for people somewhere else to solve their problems or just putting up with them, the local citizens decided to finance modern treatment plants with a special levy on real property around the lake.

It took 10 years to complete the necessary facilities, but, thanks to this private initiative, Lake Washington once again provides superb outdoor recreation for an entire metropolitan region.

Similarly, in the 1960's San Diego Bay was badly soiled by untreated municipal sewage. Citizens formed a metropolitan sewage treatment system. This filtered out the contaminants and brought swimming, boating, and fishing back to that bay.

Another example is the Willamette River in Oregon. After local efforts there, the river has been so beautifully cleaned up that for the first time in 100 years you can stand on the lawn of the Governor's mansion in Salem and watch the salmon.

So, with the full force of the Federal Government, situations like this ought to yield even more easily to attention.

We believe the prognosis for Mount Hope Bay can be good if you public-spirited citizens working with your distinguished officials of government here will make full use of this conference and follow through afterwards.

We have a wonderful opportunity to start saving Narragansett Bay right now.

I have used up my time. I thank you for yours. Thank you, Mr. Chairman.

MR. STEIN: Thank you, Mr. Green.

Any comments or questions?

(No response.)

If not, thank you very much.

We now call on Dr. Charles Foster, Secretary of Environmental Affairs for the Commonwealth of Massachusetts.

Dr. Foster.

STATEMENT OF
DR. CHARLES H. W. FOSTER
SECRETARY OF ENVIRONMENTAL AFFAIRS
COMMONWEALTH OF MASSACHUSETTS
BOSTON, MASSACHUSETTS

DR. FOSTER: Mr. Chairman, official conferees, ladies and gentlemen, after listening to Mr. Green's eloquent remarks, I wasn't sure whether there was any need for the States at all.

I am Charles Foster, Secretary of the Executive Office of Environmental Affairs, one of 10 new cabinet-level agencies just created in Massachusetts. The one that I head has the primary responsibility for environmental activities.

My presence here is indicative of the concern of Governor Francis W. Sargent and the Commonwealth for the abatement of pollution in this river basin.

I have a prepared statement which I have submitted for the record, and with your permission, Mr. Chairman, I would just like to touch on the highlights of that.

Despite my presence here, the official conferee for Massachusetts will be Mr. Thomas McMahon, Director of the Division of Water Pollution Control, who will express in more detail some of the comments I would like to make at this time.

Now, it is hard not to be somewhat plaintive about these proceedings. This is the second enforcement conference that Massachusetts has been a participant at in a little over a month and a half. If we continue at the present rate, probably 10 percent of our official time will be spent on such proceedings. And I only wish there was more light and a little less heat in these kinds of conferences.

Now, Massachusetts is concerned about several aspects of the conference today, and let me summarize these very briefly.

Dr. Charles H. W. Foster

The report prepared by the Environmental Protection Agency for Mount Hope Bay is almost completely unacceptable to Massachusetts in its present form. There are outright errors of fact in it which I hope Mr. McMahon will express in more detail, and there are some distortions in terms of the pollution abatement effort which derive from these factual errors.

We are prepared to recommend that the entire sections on conclusions and recommendations will have to be rewritten and other sections substantially amended. And we may have to request an adjournment of this conference in order to really arrive at a report which is mutually acceptable to the Federal Government and the Commonwealth.

Secondly, we do take exception to the manner in which the report was prepared. Since much of the data was derived from State sources and State records, there would seem to be no real excuse for the errors that are in the report.

The report itself was available only a matter of days for review. And if it had been a joint product, which it probably should have been and others I hope will be in the future, there would have been an opportunity to correct the inadequacies and their associated inferences.

We are also concerned that the report makes little mention of the progress that has been made in terms of pollution abatement.

One must recognize that this basin is a difficult one in many respects. It has a high degree of industrial development. It is still a section of the region that is economically depressed. Consequently, the progress that has been made, and in particular the investments made, by those directly involved in pollution I think are encouraging steps forward and should have been recognized as such.

Fourthly, we feel that the report is rather one-sided in terms of the actions to be taken. Massachusetts feels that there is much that the Federal Government can do to expedite the pollution abatement job, and we will suggest several specifics in that respect.

One, the statutory responsibilities that EPA has for the whole question of oil pollution and some improvements in the handling of oil, particularly on shipboard.

We feel that there needs to be appropriate resolution by the Federal Government of the question of dredging and the placement of the dredging spoil. This seems to be a problem that involves the Corps of

Engineers and the Environmental Protection Agency, and we would recommend that this be expedited promptly in order to reduce the likelihood of accident in some of the transport projects that now take place.

Finally, I think we feel that there needs to be some strong Federal leadership in developing a cooperative water quality monitoring effort for Mount Hope Bay and a basic survey of biotic resources in the bay so that we really can assess the full impact of some of these developments on the bay's resources.

While the nature of these remarks, Mr. Chairman, has been I'm afraid somewhat negative, we do feel that these things must be said.

I would not want to close my remarks, however, without assuring you that Massachusetts is prepared to do its part in the pollution abatement program that has to be accomplished for this basin. And if at this conference, or growing out of these conference proceedings, we can develop the kind of cooperative program that will really make this happen, then I think the time and effort spent on these proceedings will certainly be worthwhile.

Thank you very much for giving me an opportunity to participate.

(The prepared statement follows.)

PREPARED STATEMENT OF DR. CHARLES H. W. FOSTER, SECRETARY OF ENVIRONMENTAL AFFAIRS, COMMONWEALTH OF MASSACHUSETTS

Barely 4 months from the inception of the cabinet system of government in Massachusetts, I find myself attending the second Federal enforcement conference called by the Environmental Protection Agency in which the Commonwealth is a direct participant. I am reminded of my earlier expressed hope that the agencies of the State and Federal governments might find some way of ending the charade of fault-finding that these sessions represent and get on with the basic job of cleaning up polluted waters.

If this session proves similar to the Boston Harbor conference several weeks ago, the Commonwealth representative will return home on Wednesday still bearing the principal responsibility for water pollution control with both the Federal conferee and the general public seemingly unappreciative of the real strides in pollution abatement that have taken place in this region in recent years.

Therefore, as a prelude to the discussions to follow, let me highlight what has taken place in the Massachusetts portion of the basin to give us, as it were, mounting hope for the future.

The State implementation schedule lists 12 municipal and 46 industrial violators in various stages of compliance. Municipal facilities have been constructed in Somerset, Brockton, and Bridgewater, and construction is now underway in Fall River and Taunton. The total cost of these projects will exceed $18 million.

Of the 46 industrial sources, 18 have completed their programs, five are under construction, and the remainder are preparing either engineering reports or final plans.

As further evidence of progress, a recent municipal and industrial discharge survey of 50 potential polluters revealed 17 not polluting, 20 minor violations to be corrected locally, and 12 dischargers on which orders have been issued or will be issued shortly.

Finally, as Director Thomas C. McMahon, the Commonwealth's official conferee, will indicate in more detail later on, Massachusetts is deeply disappointed in the report written by the Environmental Protection Agency for this basin. Despite the fact that the data was drawn largely from State sources, many instances of either outright error or distortion have been identified in the document.

If the report had been a joint product, or if the manuscript had been available to the State more than a matter of days before the conference began, these inadequacies and their associated inferences could have been corrected before being spread on the public record.

As it now stands, the Commonwealth will recommend that the conclusions and recommendations be entirely rewritten, that certain sections of the report itself be amended to reflect the true facts, and that the conferees assemble at a later date to work out the final findings.

Massachusetts will also take the liberty of submitting for the record its own set of recommendations relating to the Mount Hope Bay Basin. Contrary to conventional enforcement conference proceedings, it will have the temerity to suggest ways in which the Federal Government, not just the States, can expedite the pollution abatement task.

Among others, these will include the fulfillment of specific responsibilities given the Environmental Protection Agency by the President and the Congress relating to oil pollution, leadership in devising solutions to the disposal of polluted spoil from dredging operations, and a cooperative research effort to monitor water quality and examine the biotic resources of Mount Hope Bay and its principal tributaries.

The recommendations are set forth on the premise that an important region such as Mount Hope Bay deserves the collective best of all levels of government and that time, money, and valuable environmental resources can be saved through a cooperative rather than competitive approach by pollution abatement agencies.

- - -

MR. STEIN: Thank you, Dr. Foster.

As you can see, we are off and running.

(Laughter)

You know, it has been said the policeman's lot is not a happy one.

I think one of the problems that we have -- and this is a significant one -- is this question of Federal-State relations. And what Dr. Foster said perhaps is not unusual in a State comment or a comment perhaps in regard to these relations. I would like to say that I am very sympathetic to his point of view, and I believe we should cooperate.

I would like to say one thing on the optimistic side. That is, in Federal-State relationships, if there isn't a certain amount of tension, then you know something is wrong. If there is this tension, then I think the citizen can feel something is right.

Dr. Foster spoke about Mr. Green's eloquent speech and said he wondered why we needed the States. I think as long as you hold office, Hank, Massachusetts surely will foster States' rights.

But let's go on.

I wonder if we could call on Mr. Pahren for the Federal presentation.

MR. PAHREN: Thank you, Mr. Stein.

To open the --

MR. STEIN: Let me interrupt for one more thing before we do this.

I think, Dr. Foster, you made one point about the report. I don't know that the differences can be resolved. But I think the purpose of the conference is to see how close we can come at this session. If we are not successful in doing that -- and you alluded to a possible request for more time or a recess to do it -- I would suggest we keep that in mind to get a time schedule if we are going to entertain that.

If this is what we are going to come up with, we really should examine the differences we have and come up with a reasonable judgment on how long we think it might take us to get together.

Mr. Pahren.

MR. PAHREN: I will now call upon Mr. Myron Knudson from Region I, EPA, who will present the staff report to the conference.

STATEMENT OF
MYRON O. KNUDSON
CHIEF, SURVEILLANCE BRANCH
SURVEILLANCE AND ANALYSIS DIVISION
ENVIRONMENTAL PROTECTION AGENCY, REGION I
NEEDHAM HEIGHTS, MASSACHUSETTS

MR. KNUDSON: My name is Myron O. Knudson. I am Chief, Surveillance Branch, Surveillance and Analysis Division, Region I, Environmental Protection Agency.

Mr. Chairman, with your permission, I would like the entire report entered into the record. However, I would only choose to read a portion of it.

MR. STEIN: All right. Without objection, the entire report will be entered into the record as if read.

MR. KNUDSON: (reading report)

INTRODUCTION

DESCRIPTION OF AREA

Mount Hope Bay, which lies approximately 14 miles southeast of Providence, Rhode Island and 46 miles southwest of Boston, forms the northeast corner of Narragansett Bay. (See foldout map at the rear of the report.)

The bay covers approximately 14 square miles and has a drainage basin of more than 570 square miles. Mount Hope Bay is divided by the Massachusetts-Rhode Island state boundary, which crosses the bay in a southeasterly direction. While 71 percent of Mount Hope Bay lies in Rhode Island, over 90 percent of the drainage area is located in Massachusetts.

Five rivers discharge to Mount Hope Bay. They are the Taunton, Cole, Lee, Kickamuit, and Quequechan. All, except the Kickamuit River, originate and terminate in Massachusetts. The Kickamuit River originates in Massachusetts and terminates in the Rhode Island portion of Mount Hope Bay.

The land areas in the basin are generally less than 200 feet above sea level. Much of the area is level, broken only by gently rolling hills.

The soils of the basin are characteristic of those formed by glacial outwash and recession, moist, and of good texture. The glacial action and low elevations are responsible for large swamp and marsh lands.

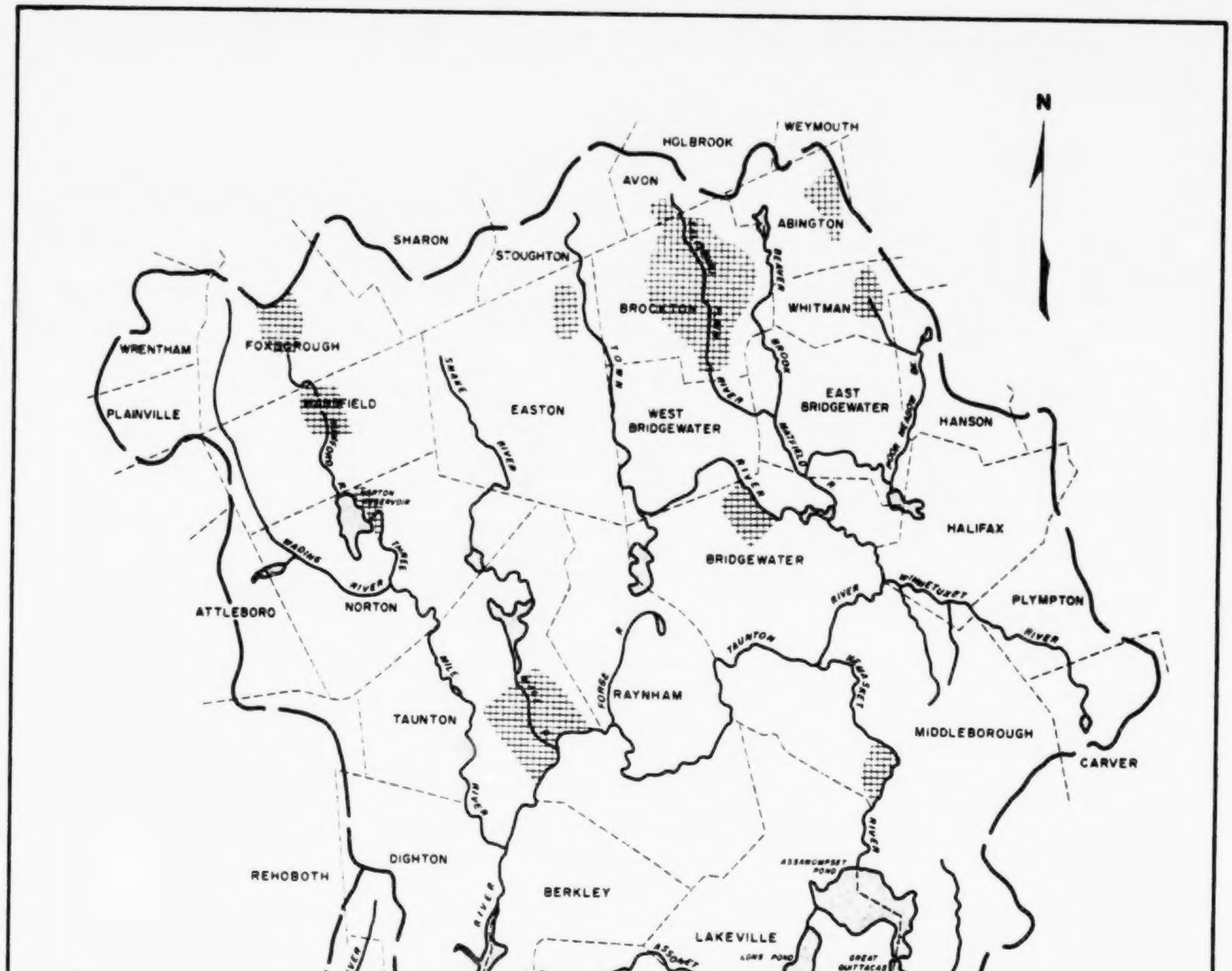
The streams of the basin are usually slow-moving and meandering. The rivers which enter Mount Hope Bay develop wide estuaries at their mouths, characteristic of a submergent coast.

POPULATION AND ECONOMY

Twenty-five communities, including two Standard Metropolitan Statistical Areas (SMSAs), lie within the Mount Hope Bay watershed. Table 1 lists the communities, populations, and selected population projections. Figure 1 shows urban areas in communities exceeding 8,000 persons. Only two communities in the Mount Hope Bay watershed and a portion of the Fall River SMSA are in Rhode Island.

Approximately 400,000 persons inhabit the drainage area of which 93 percent reside in Massachusetts. Approximately 54 percent of the work force is employed in the manufacturing industry, 23 percent in the wholesale-retail trade industry, and the remainder of the work force, 23 percent, are in utility, financial, construction, and agricultural industries.

Projections prepared for the Southeastern Regional Planning and Economic Development District indicate that populations in the urban areas are expected


N
HOLBROOK
WEYMOUTH
AVON
ABINGTON
SHARON
STOUGHTON
BROCKTON
WHITMAN
WRENTHAM
FOXBOROUGH
MANSFIELD
PLAINVILLE
EASTON
WEST BRIDGEWATER
EAST BRIDGEWATER
HANSON
HALIFAX
BRIDGEWATER
PLYMPTON
ATTLEBORO
NORTON
RAYNHAM
TAUNTON
MIDDLEBOROUGH
CARVER
REHOBOTH
DIGHTON
BERKLEY
LAKEVILLE
ROCHESTER
FREETOWN
SWANSEA
SOMERSET
WARWICK
WARREN
FALL RIVER
BRISTOL
WESTPORT
TIVERTON
PRUDENCE IS.
PORTSMOUTH
WADING RIVER
THREE MILE RIVER
SNAKE RIVER
TOWN RIVER
SALISBURY PLAIN RIVER
BEAVER BROOK
MATFIELD RIVER
POOR MEADOW BR.
TAUNTON RIVER
WINNETUXET RIVER
NEMASKET RIVER
FORGE R.
ASSONET RIVER
PALMER RIVER
RUNNINS RIVER
COLE R.
KICKAMUIT R.
MT. HOPE BAY
NORTON RESERVOIR
ASSAWOMPSET POND
LONG POND
GREAT QUITTACAS POND
NORTH WATUPPA POND
SOUTH WATUPPA POND
MASSACHUSETTS RHODE ISLAND
LEGEND
Urban Areas With Populations Greater Than 8,000
MASS
CONN
R.I.
LOCATION MAP
1 0 1 2 3 4 5
SCALE IN MILES

MT. HOPE BAY WATERSHED
URBAN AREAS

FIGURE 1

TABLE 1

MT. HOPE BAY DRAINAGE BASIN
1965 POPULATIONS[1] AND SELECTED PROJECTIONS

Municipality	Population		
	1965	1975[3]	1990[3]
Abington	11,790		
Berkley	1,769	2,300	3,400
Bridgewater	11,056		
Brockton	83,499		
Dighton	4,131	5,700	8,700
East Bridgewater	6,139[2]		
Easton	9,078[2]		
Fall River	98,053	103,000	115,000
Foxborough	12,223	17,700	31,000
Freetown	3,039[2]	4,000	6,200
Halifax	2,637		
Hanson	5,285		
Lakeville	3,773	4,800	7,300
Mansfield	8,620	9,800	12,300
Middleborough	11,726	15,000	21,300
Norton	6,737	10,300	15,700
Plympton	1,060	1,400	2,500
Raynham	5,937	8,200	14,200
Somerset	15,080	18,900	24,700
Swansea	11,767	15,600	20,600
Taunton	42,018	46,100	52,800
West Bridgewater	5,069[2]		
Whitman	12,373		
Rhode Island			
Bristol	14,570[2]		
North Tiverton	9,461[2]	15,000	22,000

[1] 1965 Commonwealth of Massachusetts census

[2] 1960 U. S. Census figures

[3] *Regional Study for Water Supply, Sewage Disposal and Drainage for Southeastern Massachusetts* (See Bibliography No. 5)

to stabilize, and suburban populations will begin rapid expansion.

The prosperity of the Mount Hope Bay watershed declines southward. Reflecting the depressed economy is the near stable or slightly declining populations encountered in the lower basin. This population trend is even more significant considering the population explosion of the late 1940's. Manufacturing in these southern areas was booming at the turn of the century, but with changes in transportation patterns -- automobiles, trucks, trains, and aircraft replacing ships -- new trade centers developed.

In the northern portions of the watershed, especially the Brockton and Foxborough areas, both population and manufacturing are increasing. These increases may be attributed to the exodus of persons and firms from the core of Boston.

Most of the communities in the watershed employ persons in local manufacturing, but major sources of employment are in Brockton, Fall River, and Taunton.

Two SMSAs lie within the drainage basin -- Brockton and Fall River. According to the 1960 U. S. Census, combined statistics, these two areas (Rhode Island portion of the Fall River SMSA not included) represented 5 percent of the firms, 3.8 percent of the annual payroll, and 4.4 percent of employment in Massachusetts.

The Brockton SMSA has grown rapidly in recent years. In the period from 1950 to 1960, the population of the area increased by 29,730 persons, or 24.8 percent.

The Brockton SMSA is predominantly a manufacturing area. In 1965, leather and leather product firms were the major employers, followed by textile mill products, food and kindred products, and electrical machinery firms. However, recent competition from foreign leather firms has forced the closing of several Brockton leather companies. At this time, the future of the leather industry is uncertain.

The population of the Fall River SMSA, unlike that of Brockton, has remained relatively stable since 1920. In 1960, the total population was 138,956 persons. Rhode Island residents comprised 9,461 persons.

At the turn of the century, Fall River thrived as a center for the cotton textile industry. In the 1920's many of the large textile firms closed. Today, after struggling through great economic losses, Fall River is recovering from the collapse of its textile industries. Like Brockton, manufacturing is the principal employer in the area. The three major kinds of manufacturing listed in their order of importance are apparel and other finished goods, textile mill products, and rubber products.

The only other urban community exerting substantial influence on the bay area is Taunton, Massachusetts. The 1965 State census reported a Taunton population of 42,018 persons.

Manufacturing is the mainstay of Taunton's economy. In 1966 over 64 percent of the work force was employed in manufacturing and more than 19 percent were working in the wholesale and retail trade industries.

HYDROGRAPHY

MOUNT HOPE BAY

Mount Hope Bay comprises about 14 square miles of water surface. The bay area includes five river basins -- the Taunton, Lee, Cole, Kickamuit, and the Quequechan. The most important of these is the Taunton River Basin.

Mount Hope Bay empties into the East Passage of Narragansett Bay and also to the ocean via the Sakonnet River. About 70 percent of the bay has a mean low water (MLW) depth less than 18 feet. Starting at a Mount Hope Bay bridge (see Figure 2), a natural channel extends

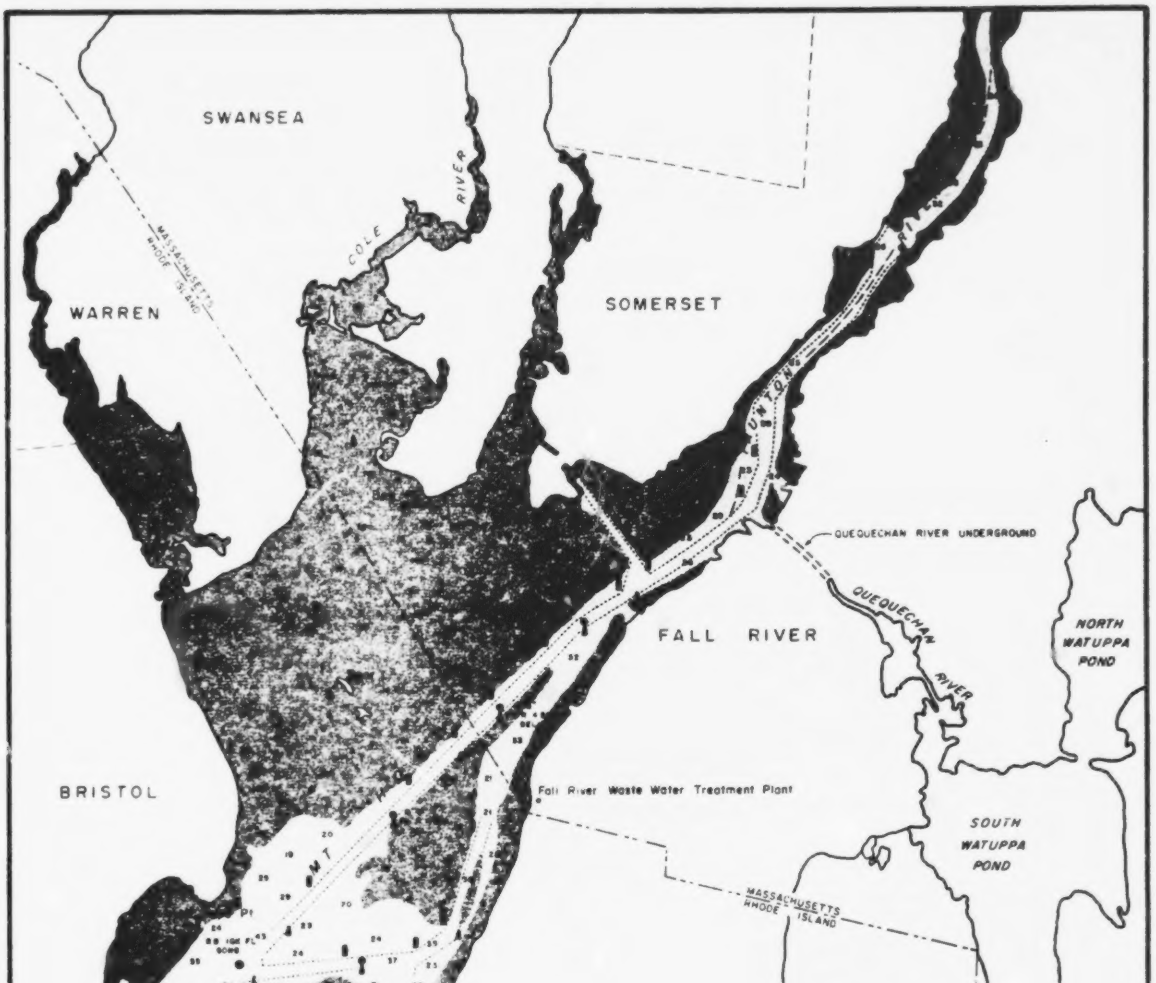

SWANSEA
COLE RIVER
MASSACHUSETTS
RHODE ISLAND
WARREN
SOMERSET
RIVER
QUEQUECHAN RIVER UNDERGROUND
QUEQUECHAN RIVER
FALL RIVER
NORTH WATUPPA POND
BRISTOL
Fall River Waste Water Treatment Plant
SOUTH WATUPPA POND
MASSACHUSETTS
RHODE ISLAND
Common Fence Pt.
TIVERTON
N
Bristol Pt.
Mt. Hope Bridge
LIMIT OF STUDY
SAKONNET RIVER
LIMIT OF STUDY
STAFFORD POND
PORTSMOUTH
LEGEND
Depths Under 19 Ft.
Depths 19 Ft. and Over
Black Can Buoy
Red Nun Buoy
Navigation Light Buoy
Soundings in feet at mean low water.
MASS
CONN
RI
LOCATION MAP
MT. HOPE BAY
HYDROGRAPHY
0
SCALE IN MILES

FIGURE 2

to a point between Mount Hope Point and Common Fence Point. From this point a man-made channel 400 feet wide with a MLW depth of 35 feet extends about 2.0 miles to the mouth of the Taunton River and approximately 4.9 miles up the river. From approximately the same point, another channel of like dimensions extends more easterly about 1.4 miles before extending northerly about 1 mile toward Fall River. Two miles north of the mouth of the Taunton River a private channel extends northwesterly approximately 1.0 miles toward Brayton Point.

Tidal fluctuations for Mount Hope Bay as measured at Fall River indicate a mean tide range of approximately 4.4 feet. During spring tides, this range will increase to about 5.5 feet. During the maximum tidal condition, the average current on flood tide is approximately 0.4 knots and on ebb tide approximately 0.5 knots.

Wind direction exerts a strong influence on mixing patterns in the bay with a southerly wind providing the greatest mixing in Mount Hope Bay.

TAUNTON RIVER

The Taunton River is approximately 38 miles long and encompasses a drainage area of over 520 square miles or 92 percent of the Mount Hope Bay watershed. Average annual discharge at the State Farm Gage in Bridgewater (drainage area 260 square miles) is 474 cubic feet per second (cfs) based on 40 years of record. During the 1968 water year, flows ranged from a peak daily flow of 4,903 cfs in March to a minimum daily flow of 37 cfs in September. The average one in 10-year 7-day low flow at the State Farm Gage is 20 cfs. At the river's mouth this low flow is 44 cfs.

The Taunton River is formed in Bridgewater, Massachusetts by the confluence of the Matfield River and the Town River which have their headwaters in Brockton and Easton, respectively. The rivers contribute equally to the flow of the Taunton River, but the influence of Brockton's sewage makes the Matfield River more significant.

Two other major tributaries -- the Winnetuxet River and the Nemasket River -- join the Taunton in its freshwater portion. The Mill, Three Mile, Segregansett, and Assonet Rivers spill into the Taunton River estuary. Table 2 indicates effective drainage areas at selected sites in the Taunton Basin.

The channel of the Taunton River is subject to tidal influence 30 miles from its mouth and is tidal (subject to flow reversal) for nearly 20 miles to a point upstream of Taunton (see base map).

TABLE 2

SELECTED DRAINAGE AREAS

TAUNTON RIVER BASIN

Watershed	Area in Square Miles
Matfield R. and Salisbury Plain R.	77.33
Town River	60.81
Winnetuxet R. (+ a small amount of the Taunton R.)	48.05
Namasket River	72.76
Mill River	44.67
Taunton River - confluence with Three Mile River to State Farm Gage	62.11
Rumford River	22.00
Wading River	42.70
Three Mile River	22.21
Assonet River	34.86
Taunton River - mouth to Three Mile River	41.49

- -

DRAINAGE AREA ALONG TAUNTON RIVER

Location	River Mile	Area
Taunton at head	41.2	138.14
Taunton at State Farm Gage	32.9	260.00
Taunton at confluence with Three Mile River	13.7	446.59
Taunton near Battleship Cove	3.7	522.94
Massachusetts-Rhode Island State Line	0.0	--

The Taunton River has a channel with a minimum mean low water depth of 19 feet extending up to its confluence with the Assonet River. From the confluence to Pierces Point is a dredged channel with a controlling MLW depth of 7 feet. A channel with a 4-foot depth continues from Pierces Point to the Taunton municipal wharf.

COLE AND LEE RIVERS

The basins of the Cole and Lee Rivers comprise 21 square miles. The Cole River rises in Dighton and flows southerly about 2.4 miles to Mount Hope Bay. The Lee River is approximately 2.7 miles long with headwaters in Swansea, but is of particular interest because it receives about 620 million gallons of heated effluent daily from a New England Power Company generating station at Brayton Point.

QUEQUECHAN RIVER

The Quequechan River originates at the Watuppa Ponds and flows westerly about 2.2 miles before discharging to Mount Hope Bay. The downstream portion of the river flows in an underground culvert about 1.0 mile before discharging to Mount Hope Bay. Many industries use the river as a waste receptacle: Arkwright Finishing, Artcraft Fixtures, Elbe File & Binder, Newport Finishing Corporation, Providence Pile & Fabric, and Ross Matthews

Corporation. The river is considered a sewer by many people.

KICKAMUIT RIVER

The Kickamuit River is over 6.3 miles long and is the only river that is an interstate river unto itself. Having its headwaters in Swansea, Massachusetts, it flows southward into Bristol, Rhode Island and terminates at Mount Hope Bay.

POLLUTION SOURCES

Nearly all known pollution sources discharging to Mount Hope Bay originate in Massachusetts. These sources contribute municipal wastes, industrial wastes, combined sewer overflows, and heated effluents. The Rhode Island communities in the watershed are served by individual disposal systems. Oil pollution is a problem at oil terminals in Tiverton, Rhode Island.

Wastes from Federal installations in the watershed are served by individual subsurface disposal systems or municipal sewers. There are no known discharges from Federal installations to the surface waters of the Mount Hope Bay drainage basin.

Wastes are generally classified into two categories -- municipal wastes and industrial wastes.

Municipal wastes are organic in nature and contain human excrement, tissue, soaps and detergents, garbage, and the spent water supply of the community. Being organic, they will maintain, support, and propagate a bacterial population which can exert a substantial oxygen demand (biochemical oxygen demand) while they are feeding on the organic materials. Excessive growths of bacteria can deplete the oxygen in a stream. The wastes also contain large populations of intestinal bacteria, including pathogenic organisms.

Objectionable surface scums, sludge deposits, and turbidity may result in a stream from municipal wastes which contain greasy substances, settleable solids, and suspended solids. Domestic portions of the wastes are unstable, decomposable, or putrescible. The decay of these wastes may give rise to offensive odors such as hydrogen sulfide (rotten egg odor).

Industrial wastes may also contain oxygen-demanding materials, settleable and suspended solids, and greasy substances and oils. In addition, some industrial wastes contain objectionable chemicals and toxic substances that can taint fish flesh, kill aquatic life, and damage a water source for use as a municipal supply.

Industries also use water extensively for cooling purposes. Heated waters can reduce the dissolved oxygen saturation concentration of a water body and increase the rate of biochemical oxidation of organic wastes, further reducing the dissolved oxygen content.

Treatment given to wastewaters to prevent harmful pollution of the environment is classified as primary, secondary, and tertiary treatment. Each classification is based on the degree that certain constituents are removed from the wastewater. Primary treatment is that degree of treatment which will remove 50 percent of the suspended solids and 30 percent of the 5-day biochemical oxygen demand (BOD_5). Secondary treatment is defined as the treatment required to remove 85 percent of the suspended solids and BOD_5. Tertiary treatment is that treatment necessary for the removal of certain waste constituents -- nutrients, metals, and toxic chemicals -- over and above those amounts removed by secondary treatment. Tertiary treatment will accomplish 95 to 99 percent removal of suspended solids and BOD_5.

MUNICIPAL

There are seven municipal wastewater treatment plants discharging to the Mount Hope Bay watershed. All are located in Massachusetts. Two of the largest plants -- Fall River and Taunton -- are designed to provide only primary treatment. The Fall River treatment plant discharges to Mount Hope Bay, while the other six discharge to the Taunton River and its tributaries.

Table 3 lists the municipal type wastewater treatment plants, population served, average flow, and State or federally approved implementation schedule where applicable. Plant locations are shown in Figure 3.

FALL RIVER WASTEWATER TREATMENT PLANT

The Fall River wastewater treatment plant is the largest treatment plant in the area. The plant is located on the east shore of Mount Hope Bay several hundred feet from the Rhode Island border (see Figure 4). The proximity of the state boundary necessitated bending the plant's effluent line to prevent discharging directly into Rhode Island's waters.

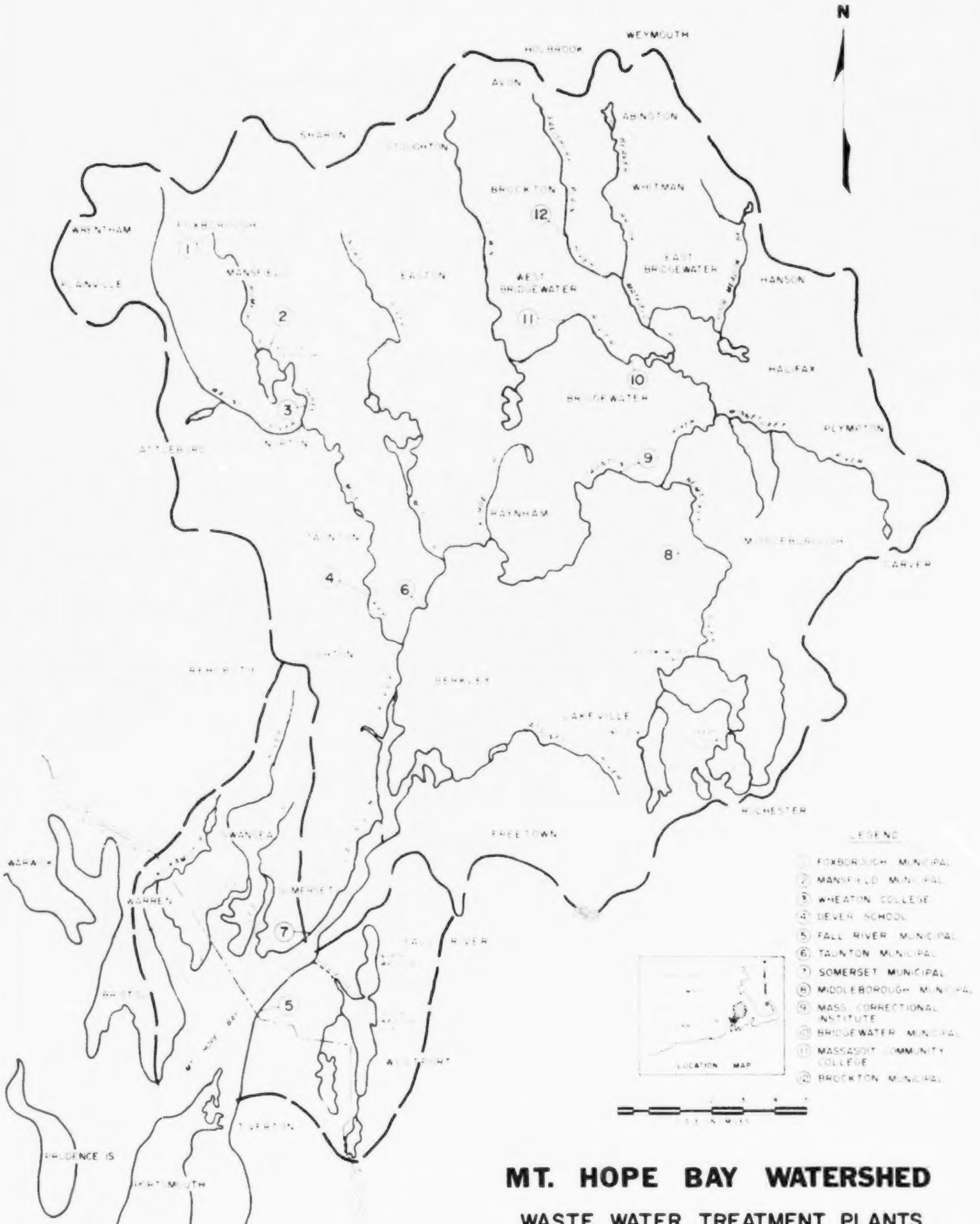
This primary treatment facility receives wastes from a combined sewer system serving 95,000 persons. The plant is designed for an average flow of 15.0 mgd. In 1970 the plant received an average flow of 22.0 mgd and discharged more than 30,000 pounds of BOD_5 daily. The plant does not provide adequate primary treatment to the wastes.

Furthermore, because a combined sewer system feeds the plant, grit and debris from storm runoff create severe problems within the plant. During periods of

TABLE 3

MUNICIPAL, PUBLIC AND PRIVATE SOURCES OF DOMESTIC WASTES
MT. HOPE BAY WATERSHED

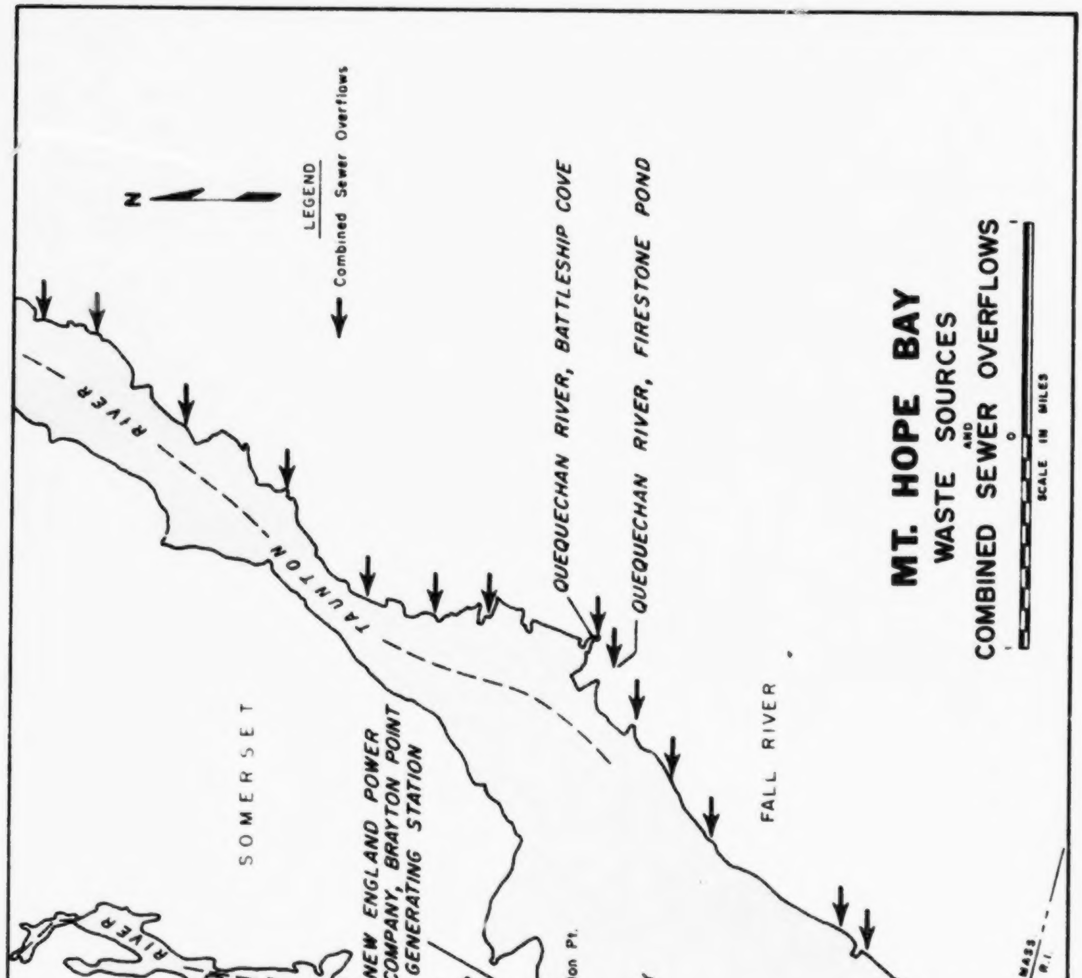
Municipality	Source	Receiving Water	Est. Pop. Served	With Combined Sewers	Ave. Flow (MGD)	Present Treatment	Proposed Treatment	FEDERALLY APPROVED OR STATE IMPLEMENTATION SCHEDULE Prelim. Plans	Final Plans	Begin Const.	Complete Const.	Status	Federally Approved Dates
Bridgewater	Municipal	Town River	2,000	No	0.2	Second.	None	Not on Implementation				Compliance	
	Mass. Correctional Institute	Sawmill Brook	2,800	Yes	0.2	Second.	None	Not on Implementation				Compliance	
Brockton	Municipal	Salisbury Plain R.	64,500	Yes	7.0	Second.	Tertiary	3/73[1]	5/73	7/73	9/74	Compliance status not known	
Dighton, North	Municipal	Three Mile R.	1,300	No	Unknown	None	Second.	Complete	11/70	3/71	3/72	Noncompliance	
Fall River	Municipal	Mt. Hope Bay	95,000	Yes	14.9	Primary	Primary	Complete	9/67	12/67	12/68	Noncompliance	•
Foxborough	Municipal	Robinson Brook	500	Yes	0.5	Septic Tank	Second.	Complete	1/72	3/72	4/73	Compliance	
Mansfield	Municipal	Norton Reservoir	4,000	No	0.5	Second.	None	Not on Implementation				Compliance status not known	
Middleborough	Municipal	Nemasket R.	5,700	No	0.7	Second.	Second.	Complete	10/72	2/73	2/74	Compliance	
Norton	Municipal	Rumford R.	Unknown	No	Unknown	None	Second.	3/71	3/72	5/72	5/73	Compliance	
	Wheaton College	Rumford R.	Unknown	No	0.1	Second.	None	Not on Implementation				Compliance status not known	
Raynham	Borden Farm	Forge R.	270	No	Unknown	Second.	None	Not on Implementation				Compliance status not known	
Somerset													
	Proj. 1	Taunton R.	Unknown	Unknown	Unknown	Primary	Second.	Complete	9/67	4/68	4/69	Compliance	•
	Proj. 2	Taunton R.	Unknown	No	Unknown	Unknown	Sewers	Complete	7/69	8/69	9/70	Noncompliance	•
Taunton	Municipal	Taunton R.	18,400	Yes	6.5	Primary	Second.	3/71	3/72	5/72	5/73	Noncompliance	•
	Paul A. Dever School	Three Mile R.	800	No	0.2	Second.	None	Not on Implementation				Compliance status not known	
Taunton, I.	Municipal	Taunton R.	Unknown	Unknown	Unknown	Unknown	Sewers	No Dates		9/67	9/68	Noncompliance	
Whitman	Municipal	Schumatuscacant R.	Unknown	Unknown	Unknown	Unknown	None	Complete	11/68	4/71	4/72	Noncompliance	


N
WEYMOUTH
HOLBROOK
AVON
ABINGTON
SHARON
STOUGHTON
BROCKTON
WHITMAN
WRENTHAM
FOXBOROUGH
PLAINVILLE
MANSFIELD
EASTON
WEST BRIDGEWATER
EAST BRIDGEWATER
HANSON
HALIFAX
BRIDGEWATER
PLYMPTON
ATTLEBORO
NORTON
RAYNHAM
TAUNTON
MIDDLEBOROUGH
CARVER
REHOBOTH
DIGHTON
BERKLEY
LAKEVILLE
ROCHESTER
SWANSEA
FREETOWN
WARWICK
WARREN
SOMERSET
FALL RIVER
BRISTOL
WESTPORT
TIVERTON
PRUDENCE IS
PORTSMOUTH
LEGEND
1 FOXBOROUGH MUNICIPAL
2 MANSFIELD MUNICIPAL
3 WHEATON COLLEGE
4 DEVER SCHOOL
5 FALL RIVER MUNICIPAL
6 TAUNTON MUNICIPAL
7 SOMERSET MUNICIPAL
8 MIDDLEBOROUGH MUNICIPAL
9 MASS. CORRECTIONAL INSTITUTE
10 BRIDGEWATER MUNICIPAL
11 MASSASOIT COMMUNITY COLLEGE
12 BROCKTON MUNICIPAL
LOCATION MAP
SCALE IN MILES

MT. HOPE BAY WATERSHED

WASTE WATER TREATMENT PLANTS

FIGURE 3


MT. HOPE BAY
WASTE SOURCES
AND
COMBINED SEWER OVERFLOWS

LEGEND
Combined Sewer Overflows
N
SCALE IN MILES
0
1
QUEQUECHAN RIVER, BATTLESHIP COVE
QUEQUECHAN RIVER, FIRESTONE POND
TAUNTON RIVER
SOMERSET
FALL RIVER
NEW ENGLAND POWER COMPANY, BRAYTON POINT GENERATING STATION
LEE RIVER
Brayton Pt.
SWAN FINISHING COMPANY
COLE RIVER
Bay Pt.
MT. HOPE BAY
Spar I.
FALL RIVER WASTE WATER TREATMENT PLANT
MASS. R.I.
SWANSEA
WARREN

FIGURE 4

intense or sustained rainfall, the plant is hydraulically overloaded and raw sewage is discharged after chlorination.

In August 1969, the city of Fall River initiated a two-stage construction program to expand its primary facilities. Phase I was the construction of a pre-chlorination facility, a desilting chamber, and a railroad spur for bulk chlorine delivery. Except for the railroad spur, Phase I has been completed.

Phase II consists of construction of a new clarifier, a sludge vacuum filter, and inplant modifications to handle a flow of 22.0 mgd. Construction and expansion of the settling tanks was started in March 1971.

If completed on schedule, the plant will provide primary treatment for the 22.0 mgd flow in March 1972. However, nearly all the Fall River industries which are currently discharging directly to receiving waters are planning to connect to the municipal sewer system. When these industries are connected, the plant will be immediately overloaded.

BROCKTON WATER POLLUTION CONTROL FACILITY

The Brockton wastewater treatment facility, serving 64,500 persons, is the second largest plant in the watershed. It is located on the southern boundary of the city of Brockton and discharges to the Salisbury

Plain River. Brockton's facility is an activated sludge plant designed to treat an average flow of 12.0 mgd. Currently, the waste flow to the plant averages 7.0 mgd. During summer months, the flow in the Salisbury Plain River is substantially that which is discharged from the Brockton treatment plant.

In addition to its location on a receiving water with inadequate flow, the plant's operation is impaired by industrial waste discharges to the municipal sewer system. Tannery wastes and those from leather manufacturers are transported to the water pollution control facility without pretreatment. Slugs of grease periodically clog the primary settling tanks and shock loads of acid waste interrupt the bacterial activity throughout the plant. Because of good maintenance and operational controls, the plant accomplishes approximately 90 percent BOD_5 removal. However, the high strength of the incoming wastes causes the final effluent to contain nearly 50 mg/l BOD_5.

Laundry wastes and those from apparel and cleaning establishments place an additional burden on the facility. Because nutrient removal facilities have not been installed, most nutrients entering the plant are passed directly to the stream. Phosphorus concentrations exceeding 25 mg/l have been recorded downstream from the plant.

TAUNTON WATER POLLUTION CONTROL PLANT

The municipal waste treatment facility in Taunton provides primary treatment to the wastes of 18,400 persons. A combined sewer system delivers domestic, industrial, and stormwater wastes to the plant at an average rate of 4.0 mgd, the present design flow for the plant. The daily treated effluent discharged to the Taunton River estuary contains 4,000 pounds of BOD_5. Sludge is dried on covered drying beds and ultimately used on site as landfill.

New industrial connections and extension of the sewer system to include the East Taunton portion of the city will place additional burdens on this plant which is already operating at capacity. The State has ordered modifications and additions to the facility to be completed by May 1973. According to the preliminary engineering report submitted to the State in November 1971, the average design flow, assuming the towns of Raynham and Dighton enter the Taunton sewer system, will be 8.4 mgd.

MIDDLEBOROUGH WATER POLLUTION CONTROL PLANT

Located on the Nemasket River, the Middleborough facility treats the industrial and domestic wastes of 4,500 persons. Designed to accommodate a waste flow of 0.75 mgd, this secondary treatment plant is treating a 0.80 mgd waste flow and discharging 460 pounds of BOD_5 daily. Middleborough has been ordered by the Commonwealth of Massachusetts to expand its treatment facilities and to include provisions for nutrient removal by February 1974.

BRIDGEWATER WASTEWATER TREATMENT PLANT

Located on the Town River, the Bridgewater treatment plant was designed to treat a waste flow of 0.6 mgd. Using trickling filters, the plant provides secondary treatment to a waste flow of 0.22 mgd from a population of 2,000 persons. The treated effluent contains approximately 25 mg/l BOD_5. Sludge is digested in converted Imhoff tanks, dried on open drying beds, and ultimately disposed of off site.

MANSFIELD WATER POLLUTION CONTROL PLANT

Using extended aeration, the Mansfield plant, serving 4,000 persons, treats an average waste flow of 0.1 mgd which is discharged to a small brook, a tributary to Norton Reservoir. Although the plant is operating at less than the design flow (1.0 mgd), chocolate wastes from Merckens Chocolate organically overload the plant. Typically, chocolate wastes contain grease, oils, high concentrations of organic wastes, and milk products.

On October 4, 1971, the State sent a letter to the chocolate company which set limits on the company's waste flow to the municipal system. The letter requires the plant to reduce the BOD_5 in its effluent to 1,660 pounds per day and the waste flow to 0.1 mgd.

FOXBOROUGH WASTEWATER TREATMENT FACILITY

The Foxborough treatment facility accommodates the wastes from 500 persons. The facility, a municipal septic tank, treats an average flow of 7,500 gpd. The more than 12,000 persons remaining are served by private subsurface disposal systems.

INDUSTRIAL

TANNERIES

The Mount Hope Bay drainage basin is dotted with pockets of industrial activity. As might be expected, the most severe problems are found in and around the major population centers. Industrial activities include tanning, textile and leather manufacturing, metal plating, and the manufacturing of chemicals.

Geilich Tanning Company, Taunton, discharges into the Taunton River, and Drew Tannery in Brockton discharges into the Salisbury Plain River. Drew Tannery has a federally-approved implementation schedule with

TABLE 4

INDUSTRIAL WASTE SOURCES
MT. HOPE BAY WATERSHED

						FEDERALLY APPROVED OR STATE IMPLEMENTATION SCHEDULE					
Municipality	Source	Receiving Water	Product	Flow (MGD)	Present Treatment	Prelim. Plans	Final Plans	Begin Const.	Complete Const.	Status	Federally Approved Dates
Abington	Abington Textile Machinery	Shumatuscacant R.	Textile machinery	Unknown	None	Not on Implementation				Compliance status not known	
	Mitchell Foods	Shumatuscacant R.		0.06	None	Not on Implementation				Compliance status not known	
	Vulnex	Shumatuscacant R.	Lining materials for shoes & luggage	0.01	Cesspool	Not on Implementation				Compliance status not known	
Avon	Hermitite Corp.	Trout Brook	Glass to metal hermetic seals	0.10	Limestone detention	Not on Implementation				Compliance status not known	
Bridgewater	Independent Nail Corp.	Town River	Nails	Unknown	Cesspool	Not on Implementation				Compliance status not known	
	Bridgewater Washed Sand & Gravel	Taunton River	Sand & gravel	Unknown	Lagoons	10/70	1/71	3/71	7/71	Compliance	
	Geo. O Jenkins #2 Mill	Town River	Fiber boards	0.35	Closed System	3/70	11/70	3/71	3/72	Compliance	*
	Stiles & Hart Brick Co.	Taunton River	Clay bricks	Unknown	No Discharge	7/70	11/70	3/71	7/71	Compliance	
Brockton	Drew Tannery	Salisbury Plain R.	Leather	0.01	None	8/70	1/71	3/71	9/71	Noncompliance	
	Empire White Star Laundry	Salisbury Plain R.	Laundry	Unknown	Storm drain	Not on Implementation				Compliance status not known	
Dighton	ICI of America, Inc.	Muddy Cove Brook	Dye Stuff	0.4	Chlorination	1/70	11/70	3/71	3/72	Noncompliance	*
	Princess House, Inc.	Three Mile River	Unknown	150 gpd	None	Not on Implementation				Compliance status not known	
	Raytheon	Three Mile River	Electrical components	0.144	None	Not on Implementation				Compliance status not known	

TABLE 4 (Continued)

Municipality	Source	Receiving Water	Product	Flow (MGD)	Present Treatment	FEDERALLY APPROVED OR STATE IMPLEMENTATION SCHEDULE				Status	Federally Approved Dates
						Prelim. Plans	Final Plans	Begin Const.	Complete Const.		
East Bridgewater	Brockton-Edison Power Co.	Matfield River	Generating station	Unknown	None	Not on Implementation				Compliance status not known	
	Dave's Launderette	Matfield River	Laundry	0.002	Secondary	Not on Implementation				Compliance status not known	
	Foxboro Company	Matfield River	Electrical instruments	0.007	Secondary	Not on Implementation				Compliance status not known	
Easton	Belcher Malleable Iron Co.	Mulberry Brook	Malleable iron castings	0.002	None	Not on Implementation				Compliance status not known	
	Charles E. Crowfoot Gear Corp.	Queset Brook	Gears & boxes	0.01	Septic Tank	Not on Implementation				Compliance status not kwon	
	Simpson Spring Co.	Queset Brook	Soft drinks	2300 gpd	Septic Tank	9/71	7/72	9/72	9/73	Noncompliance	
	Stoughton Elastic	Queset Brook	Unknown		Secondary	Not on Implementation				Compliance status not known	
Fall River	Aluminum Processing Corporation	Taunton River	Metal stampings	Unknown	None	2/71	4/71	5/71	9/71	Noncompliance	
	Anodizing Company of New England, Inc.	Quequechan River	Polishing and anodizing aluminum extrusions	0.04	None	1/70	9/70	11/70	12/71	Noncompliance	*
	Arkwright Finishing	Quequechan River	Textile finishing	3.00	None	7/70	3/71	5/71	12/71	Compliance	*
	Artcraft Fixtures	Quequechan River	Lighting fixtures	0.04	None	1/70	9/70	5/71	12/71	Noncompliance	*
	Bristol Finishing Co.	Taunton River	Textile finishing	0.078	None	1/70	9/70	11/70	12/71	Noncompliance	*
	Elbe File & Binder	Quequechan River	Composition papers	0.04	None	1/70	9/70	11/70	12/71	Noncompliance	*
	Firestone Rubber & Latex Prod. Co.	Mt. Hope Bay	Mechanical rubber goods and foam rubber	2.00	None	1/70	9/70	11/70	12/71	Out of business	*
	Industrial Trust	Taunton River	Industrial developments	Unknown	None	Unknown	3/71	4/71	9/71	Compliance	
	Newport Finishing Corporation	Quequechan River	Dyeing & finishing	2.00	None	1/70	9/70	11/70	12/71	Compliance -In municipal sewer	*
	Pearl Laundry	Taunton River	Laundry	0.019	None	1/70	9/70	11/70	12/71	Noncompliance	*

TABLE 4 (Continued)

Municipality	Source	Receiving Water	Product	Flow (MGD)	Present Treatment	FEDERALLY APPROVED OR STATE IMPLEMENTATION SCHEDULE Prelim. Plans	Final Plans	Begin Const.	Complete Const.	Status	Federally Approved Dates
Fall River	Providence Pile & Fabric	Quequechan River	Unknown	0.04	None	1/70	9/70	11/70	12/71	Compliance	•
	Ross Metthews Corp.	Quequechan River	Elastic braid & narrow fabric	0.013	None	1/70	9/70	11/70	12/71	Noncompliance	•
	Spindle City Dye Works	Taunton River	Dye cloth process	Unknown	None	5/71	12/71	2/72	7/72	Compliance	
	Sterling Pile Fabrics Corp.	S. Watuppa Pond	Corduroy	0.10	None	1/70	9/70	11/70	12/71	Noncompliance	•
Freetown	Freetown Screw Mfg. Co., Inc.	Unnamed brook	Cold headed screw products	Unknown	Grease trap & leaching field	Not on Implementation				Compliance status not known	
	Olin Thompson Plastics	Taunton River	Plastic Resin	0.144	Lagoon	3/71	3/71	6/71	12/71	Compliance	
Hanson	Ocean Spray Cranberry	Great Cedar Swamp	Cranberries & cranberry products	0.165	None	10/71	10/72	2/73	2/74	Compliance	
	Wheeler Reflector Co.	Poor Meadow Brook	Lighting fixtures	Unknown	None	Not on Implementation				Compliance status not known	
Mansfield	Blane Chemical Corp.	Rumford River	Plastics	0.39	None	Not on Implementation				Compliance status not known	
	Compo Chemical Co.	Unknown	Adhesives & coatings	Unknown	Unknown	Not on Implementation				Compliance status not known	
	Charles A. Richardson Inc.	Unknown	Metal stampings	Unknown	Unknown	Not on Implementation				Compliance status not known	
	Sweet Manufacturing	Sub-surface disposal	Jewelry chains	Unknown	Lagoons		9/68	12/68	6/69	Compliance	•
Middleborough	Di-Mo Tool Co.	Unknown	Plastic molds	Unknown	Unknown	Not on Implementation				Compliance status not known	
	Middleboro Chemical Industries, Inc.	Nemasket River	Chemicals for paper & textile industries	0.004	Subsurface disposal	3/69	6/69	8/69	12/69	Compliance	•
	Middleboro Plating Corp.	Star Pond	Zinc plating	Unknown	Cesspool	3/69	10/69	11/69	5/70	Compliance	•

TABLE 4 (Continued)

Municipality	Source	Receiving Water	Product	Flow (MGD)	Present Treatment	FEDERALLY APPROVED OR STATE IMPLEMENTATION SCHEDULE Prelim. Plans	Final Plans	Begin Const.	Complete Const.	Status	Federally Approved Dates
Norton	**Ames Textile**	**Rumford River**	**Woolen yarn**	**Unknown**	Septic tank	Not on Implementation				Compliance status not known	
	Chartley Enameling Co.	Wading River	Hard enameling	Unknown	None	Not on Implementation				Compliance status not known	
	Defiance Manufacturing Co.	Wading River	Textile finishing	2.50	None	3/71	3/72	5/72	7/73	Compliance	•
	Kilburn Glass Industry, Inc.	Wading River	Glass to metal bonding	Unknown	None	Not on Implementation				Compliance status not known	
	Lancer Industries, Inc.	Wading River	Jewelry	Unknown	None	Not on Implementation				Compliance status not known	
	Protective Controls	Chartley Brook	Thermostats	Unknown	None	Not on Implementation				Compliance status not known	
	Reliable Electroplating, Inc.	Wading River	Electroplating	Unknown	Lagoon	10/68	4/69	5/69	11/69	Compliance	•
	S & D Plating	Wading River	Electroplating	300 gpd	None	Not on Implementation				Compliance status not known	
	Sinclair Manufacturing Co.	Stone Brook	Machine shop	Unknown	None	Not on Implementation				Compliance status not known	
Somerset	Montaup Electric Co.	Taunton River	Power generation	12.50	None	Not on Implementation				Compliance status not known	
	New England Power Co. (Brayton Point)	Lee River	Power generation	820	None	12/70	2/71	3/71	9/71	Noncompliance	
	Parks Corporation	Taunton River	Resins, varnish, shellac	0.013	Septic tank (Sanitary wastes)	Not on Implementation				Compliance status not known	
Stoughton	F. H. Peterson Machine Corp.	Lovett Brook	Machine shop	50 gpd	Settling tank	Not on Implementation				Compliance status not known	
Swansea	Swan Finishing Co.,Inc.	Lee River	Textile finishing	0.30	None	2/69	9/69	11/69	7/70	Noncompliance	•
	Howard Johnson's Rest.	Lee River	Restaurant	Unknown	Septic tank	Not on implemention				Noncompliance	
Taunton	Bacon Felt Co.	Taunton River	Felt products	0.144	Septic tank	Not on Implementation				Compliance status not known	
	Dyecraftsman, Inc.	Taunton River	Skein dyeing and bleaching	0.30	Settling tank	9/71	7/72	9/72	9/73	Compliance	
	Geilich Tanning Co.	Taunton River	Leather tanning	1.00	Settling tank	3/71	3/72	5/72	5/73	Compliance	•

TABLE 4 (Continued)

[illegible]
IMPLEMENTATION SCHEDULE

Municipality	Source	Receiving Water	Product	Flow (MGD)	Present Treatment	Prelim. Plans	Final Plans	Constr. Start	Complete Constr.	Status	Federally Approved Dates
Taunton	General Work Clothes Rental	Taunton River	Laundering	Unknown	Septic tank	Not on Implementation				Compliance status not known	
	Harodite Finishing	Three Mile River	Textile finishing	0.15	None	1/70	11/71	3/71	2/72	Noncompliance	*
	Haskon, Inc.	Taunton River	Metal finishing	0.06	Settling tank	7/71	Dates to be established				
	New England Brass Co.	Mill River	Metal strips and rods	0.12	None	Not on Implementation				Compliance status not known	
	New Jersey Rubber Co.	Unnamed brook	Rubber and plastic shoe bottoms	0.01	Septic tank	1/71	1/72	7/72	7/73	Noncompliance	*
	Reed & Barton Corp.	Mill River	Sterling and plated silverware	Unknown	Settling tank	Not on Implementation				Compliance status not known	
	[illegible] Enterprises	Taunton River	[illegible]	0.001	None	1/71	2/72	[illegible]/72	[illegible]/73	Noncompliance	
	[illegible] Aluminum Corp.	Taunton River	Aluminum extrusions	0.025	Septic tank	4/71	7/72	4/72	4/73	Noncompliance	
	Sheridan Silver Co.	Taunton River	Silver-plated hollowware	0.072	None	4/71	7/72	4/72	4/73	Noncompliance	
	Synthetic Yarns	Taunton River	Textiles	0.01	Settling tank	1/71	5/71	Dates to be established		Compliance	
Whitman	Chapman Manufacturing Co.	Shumatuscacant R.	Unknown	80 gpd	Cesspool	Not on Implementation				Compliance status not known	
	Excelsior Laundry	Unnamed brook	Laundry	Unknown	None	Not on Implementation				Compliance status not known	
	Holiday Car Wash	Subsurface	Car wash	0.005	Settling tank and leaching field	Not on Implementation				Compliance status not known	
	Machinecraft	Meadow Brook	Metal stamping	0.003	Cesspool	Not on Implementation				Compliance status not known	
	McCarthy Bros. Ice Cream	Unnamed brook	Ice cream	400 gpd	Septic tank	Not on Implementation				Compliance status not known	
	United Shoe Machinery Corp.	Meadow Brook	Metal stamping	0.001	Cesspool	Not on Implementation				Compliance status not known	

TABLE 4 (Continued)

Municipality	Source	Receiving Water	Product	Flow (MGD)	Present Treatment	FEDERALLY APPROVED OR STATE IMPLEMENTATION SCHEDULE Prelim. Plans	Final Plans	Begin Const.	Complete Const.	Status	Federally Approved Dates
Whitman	Whitman Board Products, Corp.	Shumatuscacant R.	Corrugated paper-board	700 gpd	Settling tank	Not on Implementation				Compliance status not known	
	Whitman Plating Co. Inc.	Hobart Pond	Electroplating and metal finishing	0.004	Cesspool	Not on Implementation				Compliance status not known	
	Whitman Tool & Dye, Inc.	Unnamed brook	Tools and dies	Unknown	Dry well, septic tank and leach field	Not on Implementation				Compliance status not known	

September 1971 set as the date to complete construction of abatement facilities. May 1973 is the federally-approved date for Geilich Tanning Company.

The Brockton treatment plant has problems with grease and toxic materials attributed to tanneries, textile manufacturers, or leather manufacturers connected to the municipal system. An inventory of industrial connections to the Brockton system and an analysis of their wastes are necessary. Pretreatment of wastewater by some industries is necessary if the Brockton plant is to function properly.

TEXTILES AND LEATHER MANUFACTURING

Textile manufacturing, once the supporting industry for the entire bay area, still plays an important part in the economy of the area. This industry discharges significant volumes of wastes to the watershed. In the Fall River area, Arkwright Finishing, Bristol Finishing, Providence Pile and Fabric, Spindle City Dye Works, and Sterling Pile Fabrics Corporation discharge wastes without treatment despite the fact that all are on implementation schedules to abate their polluting discharges by December 1971.

Defiance Manufacturing, Norton, Massachusetts, discharges 2.5 mgd without treatment and has orders from the Massachusetts Division of Water Pollution Control to implement treatment by July 1973. Swan Finishing and Dye Company in Swansea, Massachusetts has federally-approved dates to abate pollution by July 1970. The company has not provided the required waste treatment facilities, and no progress is being made.

At Taunton, Dyecraftsman, Inc. and Synthetic Yarns discharge to the Taunton River. Harodite Finishing, also at Taunton, discharges to the Three Mile River. Harodite Finishing has until February 1972 to meet the federally-approved implementation schedule for waste treatment. The other two have orders from the Massachusetts Division of Water Pollution Control to abate the discharge of their polluting wastes, but no implementation dates have been established by the State.

ELECTROPLATING

Metal wastes are discharged from Reliable Electroplating and S & D Plating, Norton; New England Brass Company, Reed & Barton Corporation, Ronco Enterprises, Royce Aluminum Corporation, and Sheridan Silver Company, Taunton; and Middleboro Plating Corporation, Middleborough. All except Middleboro Plating Corporation have until mid-1973 to abate their pollution. Middleboro Plating Corporation had until May 1970 to implement treatment as required by the federally-approved implementation schedule. Construction of the treatment facility is behind schedule, but the company has reduced its waste flow so that after discharging to a cesspool and sand filters, there is no direct discharge to receiving waters. The effluent is lost through evaporation and percolation.

CHEMICALS

Imperial Chemical Industries of America, Dighton, manufactures industrial dyes. Mercury is contained in one of the waste byproducts from the manufacturing process used. During a June 17, 1970 interview with Arthur H. Noble, the plant manager, Richard D. Turner, supervisory inspector with the Food and Drug Administration, Boston, learned that the plant was discharging and had been discharging for a number of years approximately 26 pounds of mercuric oxide weekly. This amounts to more than 6.5 pounds a day discharged over a 4-day operating period.

This plant's wastes are discharged into Muddy Cove Brook upstream of a small hurricane barrier. The ponded area (approximately 4 acres) behind the hurricane barrier dam serves as a lagoon for the industry. The water discharged from this lagoon flows into another 4-acre shallow pond before entering the tidal waters of the Taunton River.

During July 1970, the plant modified its process to eliminate the addition of mercury compounds. Mercury is still present, however, in the raw materials used in the dye manufacturing operation. The results of an Environmental Protection Agency survey in February 1971 showed 0.37 pounds per day of mercury being discharged from Muddy Cove Brook Lagoon.

At the request of the Massachusetts Department of Natural Resources, the industry has agreed to limit the total mercury discharge to 0.3 pounds per day for a period of 1-1/2 years beginning November 1970. The State will allow no mercury to be discharged after this period. The firm generally meets the 0.3 pounds per day limit presently required. On February 17-18, 1971, a 24-hour sampling program by the Environmental Protection Agency showed that 0.37 pounds of mercury were discharged at the hurricane barrier.

Assuming that all mercury discharges were eliminated from this process within the time frame specified, there would still be a mixed heavy metals discharge problem from the lagoon. The sludge which has accumulated over the years contains significant concentrations of cobalt (39.2 mg/kg), chromium (390 mg/kg), copper (249,825 mg/kg), and lead (917 mg/kg). Leaching of these materials into the overlying waters causes a continuing discharge of hazardous heavy metals to the Taunton River. The existence of these sediments presents a real and imminent threat to the Taunton River.

A study conducted by the Environmental Protection Agency in the Taunton River in July 1970 found mercury present in the river water below the mouth of Muddy Cove Brook. Samples obtained by the Corps of Engineers during 1970 and 1971 found mercury present in the Taunton River sediments in concentrations as great as 5.15 ppm. Other heavy metals found in Muddy Cove Brook -- namely, chromium, copper, and lead -- were also reported in the river analysis.

Fish collected in this area by the Massachusetts Division of Marine Fisheries and the U. S. Food and Drug Administration, also in July 1970, and analyzed by the Food and Drug Administration, were found to contain as much as 0.75 ppm mercury. Shellfish collected by the Food and Drug Administration in June of 1970 2 miles downstream from the mouth of Muddy Cove Brook contained 0.47 ppm in their meat.

On December 4, 1970, the Massachusetts

Department of Public Health issued a warning against eating any fish taken from the Taunton River between the cities of Fall River and Taunton.

EPA's technical staff recommends that the mercury-rich sediments in Muddy Cove Brook lagoon be physically removed to a depth such that the remaining sediments contain no greater than 0.1 ppm. The sediments, after removal, should be reprocessed or disposed of in a manner that will prevent any further environmental contamination.

COMBINED SEWERS

Four municipalities in the watershed and a State-operated institution, serving a total of 181,200 persons, have combined sewers. These are identified in Table 3. During periods of rainfall, the sewers become overloaded. Large quantities of stormwater and untreated domestic and industrial wastewater are discharged directly to receiving waters as a result of combined sewer overflows. These overflows contribute organic materials, floating, suspended and settleable solids, bacteria, oil and grease, and other toxic materials to receiving waters.

Of major concern in this combined sewer problem is the Fall River sewer system which has at least 14 bypass outfalls. Seven of these discharge directly to Mount Hope Bay and the others to the Taunton estuary (see

Figure 4).

A 1965 Public Health Service report (Ronald G. Macomber, "Mt. Hope Bay (Cole River)," Massachusetts Shellfish Growing Areas (Boston: U. S. Public Health Service, 1965), pp. 1,2) has stated that both the geography of the area and the design of the area's interceptor sewer contribute to the overflow problem.

Fall River is located on a steeply rising hillside with its base paralleling the Taunton River and Mount Hope Bay. The city sewers run down the hillside to an interceptor sewer at the base, and the interceptor sewer transports the wastes to the city's primary wastewater treatment plant. Although the city has a combined sewer system, the interceptor was designed to handle dry weather flow only. Because of the steep slope of the "feeder" sewers, the residence time of runoff in these lines is very short, and almost every storm concentrates excessive amounts of wastes at the interceptor. When the interceptor becomes overloaded, untreated wastes are discharged to the receiving waters through automatic bypasses.

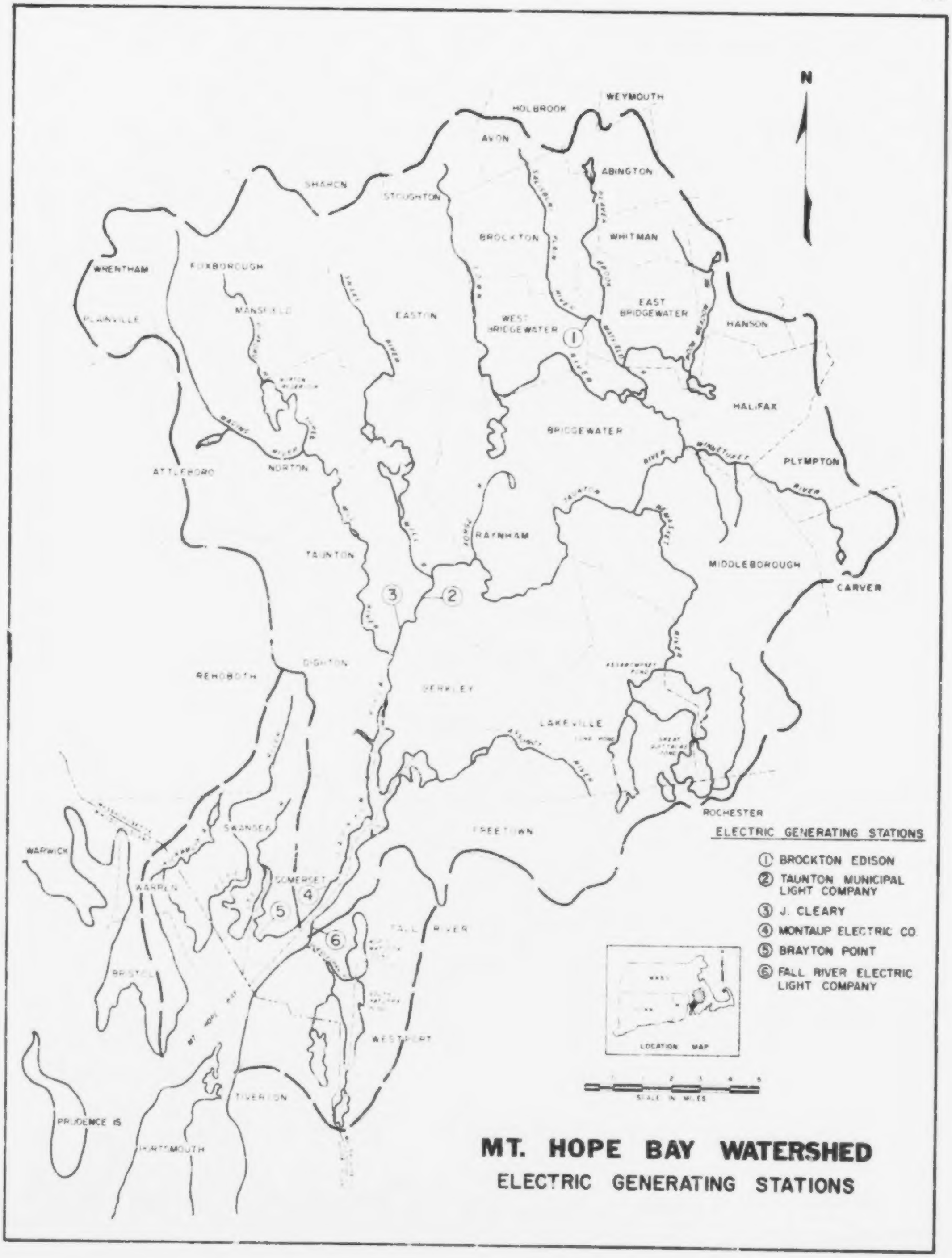
The problem is compounded by runoff velocities which scour the ground surfaces and wash silt into the system. The silt plugs the drop channel of the bypasses, and wastes are continually bypassed, even during dry weather flows, until the channel is manually cleaned.

HEATED EFFLUENTS

Presently there are six thermal electric generating stations (see Figure 5) which withdraw water from the basin for cooling purposes and return it at an elevated temperature. Their combined power generating capacity is approximately 1,578 megawatts electricity (MWe) with another 555 MWe planned for operation within the next 4 years. The power station locations are illustrated in Figure 5, while Table 5 gives the generating capability and cooling water flow of each plant. All six plants are fossil-fueled, utilizing oil and coal for combustion.

The Brayton Point station of the New England Power Company is the major source of artificially heated water to Mount Hope Bay. It is, in fact, the largest single powerplant in New England, designed to accommodate five generating units. There are currently three units in operation with a fourth planned for 1974.

A permit application for an outfall structure to accommodate Unit No. 4 has been filed with the U. S. Corps of Engineers and has received the certification of the Massachusetts Division of Water Pollution Control, under the condition that the discharge temperature will


MT. HOPE BAY WATERSHED
ELECTRIC GENERATING STATIONS

N
HOLBROOK
WEYMOUTH
AVON
ABINGTON
SHARON
STOUGHTON
BROCKTON
WHITMAN
WRENTHAM
FOXBOROUGH
MANSFIELD
EASTON
WEST BRIDGEWATER
EAST BRIDGEWATER
HANSON
PLAINVILLE
HALIFAX
BRIDGEWATER
ATTLEBORO
NORTON
PLYMPTON
RAYNHAM
TAUNTON
MIDDLEBOROUGH
CARVER
REHOBOTH
DIGHTON
BERKLEY
LAKEVILLE
ROCHESTER
SWANSEA
FREETOWN
WARWICK
WARREN
SOMERSET
FALL RIVER
BRISTOL
WESTPORT
TIVERTON
PRUDENCE IS.
PORTSMOUTH
ELECTRIC GENERATING STATIONS
① BROCKTON EDISON
② TAUNTON MUNICIPAL LIGHT COMPANY
③ J. CLEARY
④ MONTAUP ELECTRIC CO.
⑤ BRAYTON POINT
⑥ FALL RIVER ELECTRIC LIGHT COMPANY
LOCATION MAP
SCALE IN MILES

FIGURE 5

TABLE 5

THERMAL ELECTRIC POWER GENERATING STATIONS WITHIN THE MT. HOPE BAY BASIN

Station and Location	Generation Capacity (MWe)[1]	Cooling Water Flow (gpm)[2]	Ownership
1. Brayton Point, Somerset	1125	620,000	New England Power Company
Brayton Point (Proposed Addition)	465	570,000	New England Power Company
2. Montaup Electric, Somerset	344	173,000	The Eastern Utilities Company
3. Brockton-Edison, E. Bridgewater	20	26,600	The Eastern Utilities Company
4. Municipal Light Co. Taunton	47	22,400	City of Taunton
5. James Cleary Station Taunton	28	18,200	City of Taunton
James Cleary Station (Proposed Addition)	90	56,000 (Estimated)	City of Taunton
6. Fall River Station Fall River	14	4,000	Fall River Electric Light Company

[1] Megawatts of electricity

[2] Gallons per minute

not exceed 90 degrees Fahrenheit.

In order to meet this maximum discharge temperature required by the State agency, the company has added 310,000 gallons per minute (gpm) of dilution water into the design of the fourth unit, thereby increasing the total cooling water flow to 1,190,000 gpm and reducing the nominal temperature rise across the condensers from 14.8 degrees Fahrenheit to 11.6 degrees Fahrenheit. This flow would be approximately five times the average flow of the Taunton River into the bay.

The cooling water intake for this plant is located on the east side of Brayton Point at the neck of the peninsula, and the heated waters are discharged on the western side of the point into the Lee River. Historical current patterns around Brayton Point and well into the bay have been altered by the power station's pumping operations. The addition of a fourth generating unit would undoubtedly increase this effect.

Solids and refuse from the Fall River outfall are drawn toward the plant's influent canal during flood tides. Scientists from EPA's National Marine Water Quality Laboratory, Kingston, Rhode Island, have observed prophylactics being drawn toward and upon the screens at the plant's intake structure on numerous occasions.

It is believed that the wastes from Fall River are drawn into the Brayton Point generating station's intake system and discharged to the Lee River. In any event, water is being removed from the Class SB Taunton River and discharged to the Lee River which is classified as SA. The water quality of the receiving waters does not meet the assigned SA classification.

Studies developed by the National Marine Water Quality Laboratory personnel indicate that large numbers of the bay's planktonic organisms (especially the ichthyoplankton) are injured, mutilated, or killed through a combination of elevated temperatures and the physical action of the facility's mechanical pumps. This process results in not only a direct loss of estuarine populations but also the deposition of a significant organic load (comprised mainly of dead organisms) into the Lee River.

In order to protect the circulating water system from the growth of algae and other nuisance organisms, the power station utilized batch doses of chlorine daily during the mid-morning hours to eliminate this threat. Typically, approximately 300 gallons of hypochlorite solution were used per day, and chlorine residual concentrations ranging from 0.1 to 1.0 ppm have been measured at the outfall. Fish kills in the Lee River have been attributed to the cleansing operation, and on June 30, 1971 the New England Power Company was indicted for causing fish kills in the Lee River.

At the request of the EPA, the power company modified cleansing operations in April 1971. The power company has been experimenting with other methods of cleaning. Nonetheless, several fish kills have occurred in the Lee River since April.

The fly ash slurry from the station's air pollution control devices flows directly into a series of settling ponds. After depositing its suspended solids, the waste is then discharged to the Lee River just north of the powerplant. Table 6 shows the results of samples collected at the discharge (see Figure 6).

DREDGING

Because of dry cargo vessels, tankers and colliers servicing Fall River and surrounding areas, the U. S. Corps of Engineers maintains 7 miles of navigation channel in Mount Hope Bay, including a portion of the Taunton River (see Figure 2).

The Corps has requested the EPA to approve a navigation improvement project to deepen the existing channels from a mean low water (MLW) depth of 35 feet to

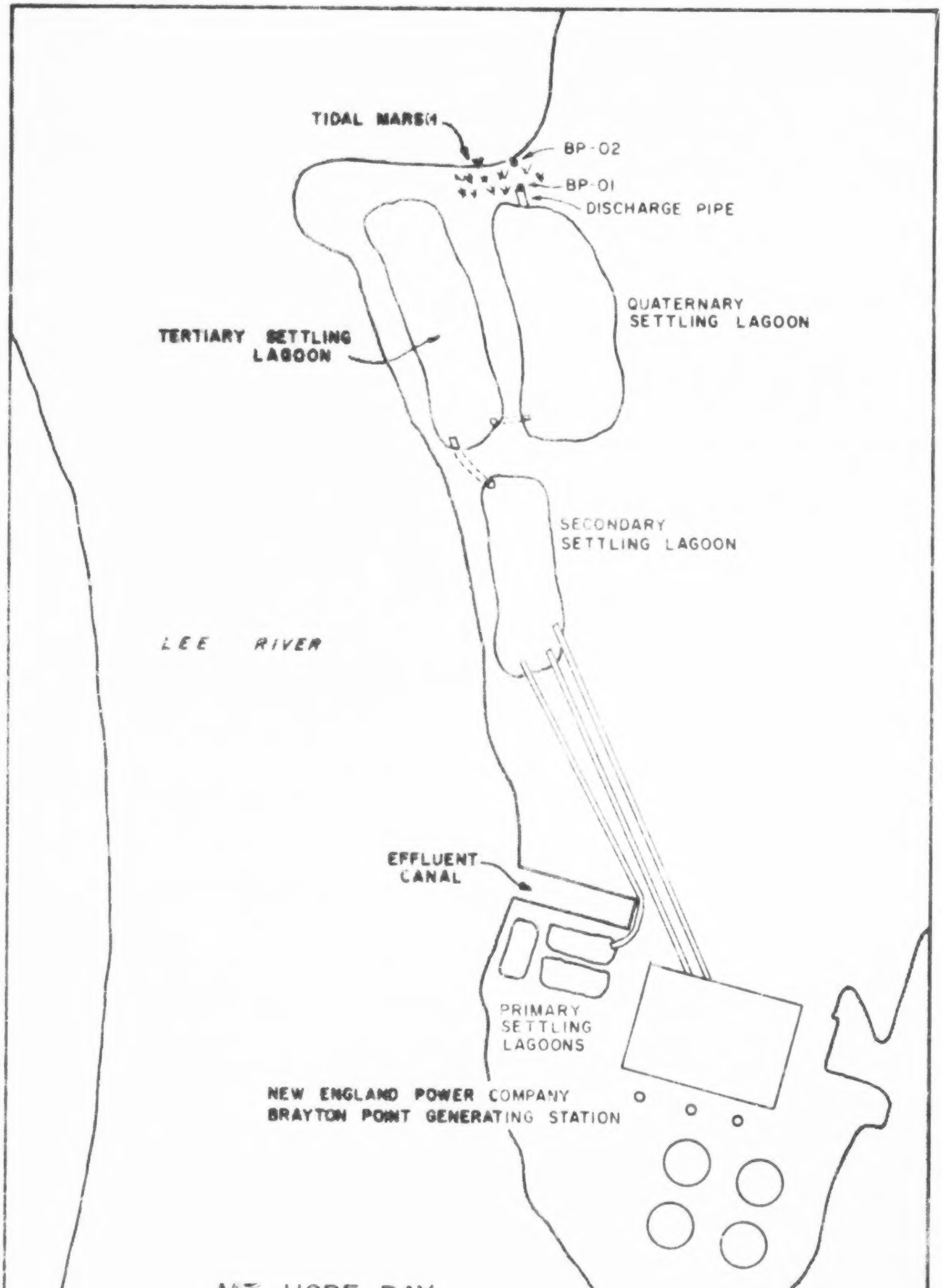

TIDAL MARSH
BP-02
BP-01
DISCHARGE PIPE
QUATERNARY SETTLING LAGOON
TERTIARY SETTLING LAGOON
SECONDARY SETTLING LAGOON
LEE RIVER
EFFLUENT CANAL
PRIMARY SETTLING LAGOONS
NEW ENGLAND POWER COMPANY
BRAYTON POINT GENERATING STATION
MT. HOPE BAY
LOCATION OF SAMPLING STATIONS
FLY ASH LAGOONS
BRAYTON PT.

FIGURE 6

TABLE 6

Test Results
Brayton Point Generating Station
Effluent from Fly Ash Lagoons

Station No.	BP-01	BP-02
Date	6/25/71	6/25/71
Time (hours)	1200	1205
Depth (feet)	1.0	1.0
Sample Temperature (°C)	26.5	26.5
Color (Platinum-Cobalt units)	200	250
pH (Std. Units)	5.7	5.7
Alkalinity (mg/l as $CaCO_3$	5.9	5.9
Acidity (mg/l as $CaCO_3$)	27	28
Total Nfilt. Residue (mg/l)	28	28
Fixed " " "	4	29
Vanadium "	48	48.7
Titanium "	K0.09	K0.09
Nickel "	3.5	3.6

*K represents less than

a MLW depth of 40 feet. The project would require the removal and disposal of approximately 4 million cubic yards of dredged material in an open ocean area.

Analyses of benthic materials by the Corps revealed high concentrations of heavy metals which are pollution hazards, especially if disturbed. The sample station locations and results of the Corps' study are shown in Figure 7 and Tables 7 and 8, respectively.

With the exception of Station KE-12, present mercury levels in the dredging area's benthos did not exceed 1.0 milligrams per kilogram (mg/kg), dry weight basis, EPA's guideline for permitting dredging. Concentrations in the Taunton River's benthos did exceed 1.0 mg/kg.

A major source of mercury in the river had been Imperial Chemical Industries of America, Inc., Dighton, Massachusetts. This industry, located on Muddy Cove Brook about 1/2 mile from the Taunton River, has reduced its mercury discharge from 26 pounds per week to generally less than the 0.3 pounds per day limit prescribed by the Massachusetts Department of Natural Resources. The State is requiring the company to reduce its mercury discharge to essentially 0.0 pounds per day during the first half of 1972.

However, an undetermined volume of sludge present

TAUNTON RIVER, MASS. (Above Fall River Harbor)
TEST RESULTS (1970-71)
TABLE 7

Explor. No.	Sample Depth (ft.)	Elev. Below MLW	Classification	*Hg % x10^{-4}	+Hg % x10^{-4}	*As % x10^{-4}	+As % x10^{-4}
G-2	0.0 - 0.3	15.9	Dk gray sandy organic silt w/shells & vegetation	3.41	4.94	8.75	12.67
G-4	0.0 - 0.3	26.3	Dk gray sandy organic silt w/shells & vegetation	2.42	3.51	14.90	21.60
G-6	0.0 - 0.3	24.4	Dk gray sandy organic silt w/numerous shells	3.10	4.50	12.60	18.27
G-8	0.0 - 0.3	29.6	Organic silty sand w/shells & vegetation	5.15	7.47	11.90	17.25
G-10	0.0 - 0.3	28.5	Vegetation w/silt, sand & shells	2.45	3.55	8.20	11.89
P-2	0.0 - 1.5	10.5	Dk gray sandy silt, w/shells & vegetation	1.92	3.05	11.90	17.81
P-4	0.0 - 1.5	8.5	Gray-brown, sandy silt w/trace of shells & vegetation	0.21	0.33	5.50	8.74
P-5	0.0 - 1.2	6.9	Gray-brown, sandy silt w/trace of shells & vegetation	1.26	2.00	7.65	12.16
P-9	0.0 - 1.4	5.6	Gray brown silt to 0.7'. Brown M-F sand to 1.4'	0.12	0.15	2.95	3.76
P-10	0.0 - 1.5	7.0	Black muck w/silt, sand, shells & vegetation	2.87	4.10	15.40	22.02

*Conc. % (wet weight basis)
+Conc. % (converted to dry weight basis)
EXPLORATION METHOD G - Petersen Dredge
P - Plastic core

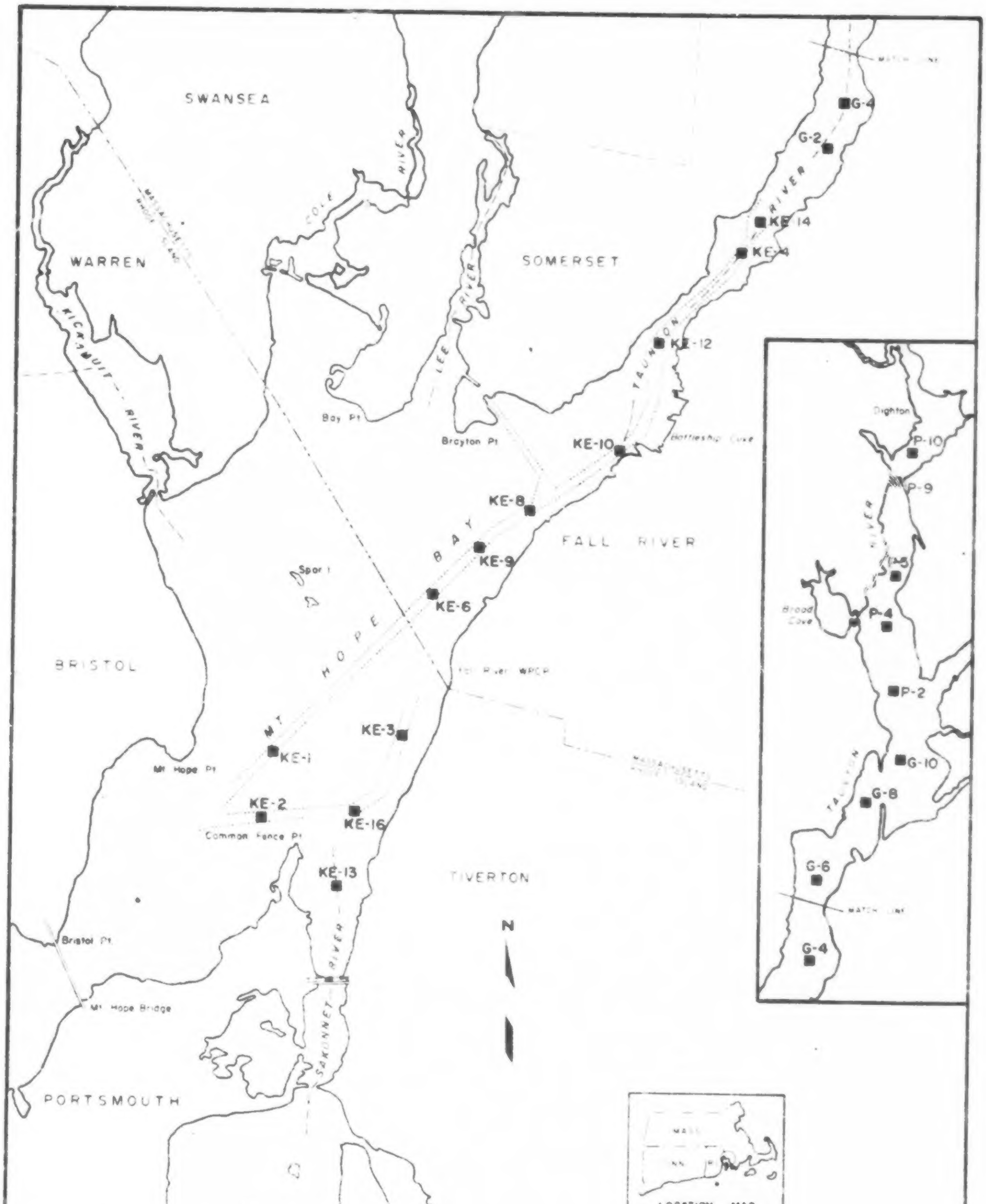

SWANSEA
WARREN
SOMERSET
BRISTOL
FALL RIVER
TIVERTON
PORTSMOUTH
COLE RIVER
LEE RIVER
KICKAMUIT RIVER
TAUNTON RIVER
SAKONNET RIVER
MT. HOPE BAY
Bay Pt
Brayton Pt
Battleship Cove
Spar I
Fall River WPCP
Mt Hope Pt
Common Fence Pt
Bristol Pt
Mt Hope Bridge
MASSACHUSETTS
RHODE ISLAND
MATCH LINE
G-4
G-2
KE-14
KE-4
KE-12
KE-10
KE-8
KE-9
KE-6
KE-3
KE-1
KE-2
KE-16
KE-13
Dighton
Broad Cove
P-10
P-9
P-6
P-4
P-2
G-10
G-8
G-6
N
MASS
LOCATION MAP
MT. HOPE BAY
STATION LOCATIONS
CORPS OF ENGINEERS
ENVIRONMENTAL EXPLORATIONS FOR HEAVY METALS
SCALE IN MILE

FIGURE 7

TABLE 8

FALL RIVER HARBOR, MASS.
TEST RESULTS

Explor. No.	*Hg % x10^{-4}	+Hg % x10^{-4}	*As % x10^{-4}	+As % x10^{-4}	*Cr % x10^{-3}	+Cr % x10^{-3}	*Cu % x10^{-4}	+Cu % x10^{-4}
KE-1	0.011	0.019	4.7	8.18	1.48	2.57	5.4	9.4
KE-2	0.0079	0.0137	4.5	7.83				
KE-3	0.140	0.241	6.55		1.75	3.01	8.8	15.1
KE-4	0.011	0.0191	4.8	11.27				
KE-6	0.12	0.209	5.3	9.20	1.75	3.04	7.4	12.9
KE-8	0.52	0.90	5.15	8.96				
KE-9	0.011	0.019	3.4	5.92				
KE-10	0.036	0.064	6.65	11.90	1.55	2.77	5.8	10.4
KE-12	1.47	2.56	5.3	9.22				
KE-13	0.062	0.108	4.2	7.31	2.35	4.09	10.8	18.8
KE-14	0.041	0.071	6.9	12.0	1.50	2.61	4.5	7.8
KE-16	0.067	0.116	3.75	6.52				

Explor. No.	*Zn % x10^{-3}	+Zn % x10^{-3}	*Pb % x10^{-3}	+Pb % x10^{-3}	*Ag % x10^{-5}	+Ag % x10^{-5}	*Cd % x10^{-5}	+Cd % x10^{-5}
KE-1	3.4	5.92	0.67	1.16	2.5	4.3	1.0	1.7
KE-2								
KE-3	4.0	6.88	1.15	1.98	3.0	5.2	<1.0	<1.7
KE-4								
KE-6	4.2	7.31	1.0	1.74	3.5	6.1	<1.0	<1.7
KE-8								
KE-9								
KE-10	3.65	6.53	7.5	1.34	1.0	1.8	1.0	1.8
KE-12								
KE-13	4.75	8.26	2.35	4.09	3.0	5.2	<1.0	<1.7
KE-14	3.25	5.65	0.70	1.22	6.0	10.4	1.0	1.7
KE-16								

Explor. No.	*Sn % x10^{-4}	+Sn % x10^{-4}	*Bi % x10^{-4}	+Bi % x10^{-4}	*I % x10^{-5}	+I % x10^{-5}
KE-1	<3.0	<5.2	<3.0	<5.2	<2.0	<3.5
KE-2						
KE-3	<3.0	<5.2	<3.0	<5.2	<2.0	<3.4
KE-4						
KE-6	<3.0	<5.2	<3.0	<5.2	<2.0	<3.5
KE-8						
KE-9						
KE-10	<3.0	<5.4	<3.0	<5.4	<2.0	<3.6
KE-12						
KE-13	<3.0	<5.2	<3.0	<5.2	<2.0	<3.5
KE-14	<3.0	<5.2	<3.0	<5.2	<2.0	<3.5
KE-16						

Samples taken using modified Kullenberg Corer (1970-71)
Testing performed using Atomic Absorption Spectrophotometer
*Conc.% (wet weight basis)
+Conc.% (converted to dry weight basis)

in Muddy Cove Brook lagoon, a ponded area, immediately downstream of the plant's outfalls, contains large quantities of mercury and other toxic heavy metals. Even after the discharge from the plant is eliminated, this sludge will continue to leach heavy metals into the overlying waters which are discharged to the Taunton River. To prevent this, the existing contaminated sediments in Muddy Cove Brook should be removed.

The navigation channels in Fall River Harbor have zinc levels exceeding the EPA guideline of 50 mg/kg, dry weight basis. Because of the overflows from the city of Fall River and the diverse sources along the shores of the bay and the rivers, no one source can be held suspect.

OIL POLLUTION

During 1969, more than 430 tankers carrying over 3,410,000 short tons of petroleum products, traversed Mount Hope Bay. These vessels included colliers and self-propelled tankers with drafts up to 34 feet. Because of a narrow bridge opening which controls traffic into the Taunton River, most of the self-propelled vessels are limited to the bay area. Tug-propelled colliers and small tankers service the Montaup Power Company (see Figure 5) and the Shell Oil Corporation terminal directly across the river.

In the bay area, tankers service the Brayton Point generating station, Somerset, Massachusetts and 10 other terminals in Fall River, Massachusetts and Tiverton, Rhode Island. Table 9 is a listing of petroleum terminals in Mount Hope Bay.

Oil losses occur frequently at Brayton Point and in the Fall River berthing areas. Primarily, the oil is lost because of spills from antiquated off-loading equipment aboard the older tankers servicing the area and tanker hull leakage.

Because of the shallow channel depth, the majority of the tankers are the older vessels (18,000-28,000 DWT, 36-foot draft). The newer mid-range (MR) tankers, because they have better types of oil-handling equipment and are partially automated, have safer off-loading practices.

Some MR vessels periodically engage in the hazardous practice of entering the bay near high tide and proceeding to the deeper channels before they are grounded by the outgoing tide. Should a miscalculation or mechanical failure occur, a vessel could be holed, which would cause an oil spill of serious magnitude.

Dredging all the channels in Mount Hope Bay would not necessarily alleviate the problem. The channel

TABLE 9

OIL TERMINALS IN MT. HOPE BAY

Location	Name	Berth Size Depth (ft.)	Berth Size Length (ft.)	Storage Capacity (Barrels)
Fall River, Mass.	Fall River Electric Light Co.	2 - 15	627	48,400
	Fall River Gas Works Co.	0 - 13	200	20,000
	Firestone Industrial Products, Inc.	0 - 26	1,574	Unknown
	Joseph A. Bowan Co.	4 - 18	513	14,571
	Pacific Oil Co.	35	700	105,000
	Shell Oil Co.	> 30	900	1,250,000
	Tide Water Associated Oil Co.	15 - 18	200	40,000
Somerset, Mass.	Brayton Point Generating Station (New England Power Co.)	34	1,200	Unknown
	Montaup Electric Company	30	610	387,000
Tiverton, R. I.	Bay Oil Company	35	700	1,200,000
	Gulf Oil Corporation	35	600	350,000
	Pacific Oil Company	34	600	327,000
	Paragon Oil Company (Texas Corp.)	35	600	300,000

serving the Fall River port passes closely to pier abutments at several points. Deepening this channel to accommodate the increased width and length of larger ships without rerouting the channel away from the abutments presents a navigation problem that could result in a disastrous oil spill.

From January through June 1971, 13 minor oil spills were reported in the Mount Hope Bay area, including the Sakonnet River. Six of these were reported in the vicinity of Tiverton, Rhode Island. Three others were reported in the Rhode Island portion of Mount Hope Bay, three at Brayton Point, and the remaining two near Fall River, Massachusetts.

EPA's Oil and Hazardous Materials Section, Region I, believes that before encouraging greater oil traffic in Mount Hope Bay, companies accepting oil shipments should develop a rapid and functional oil spill response system.

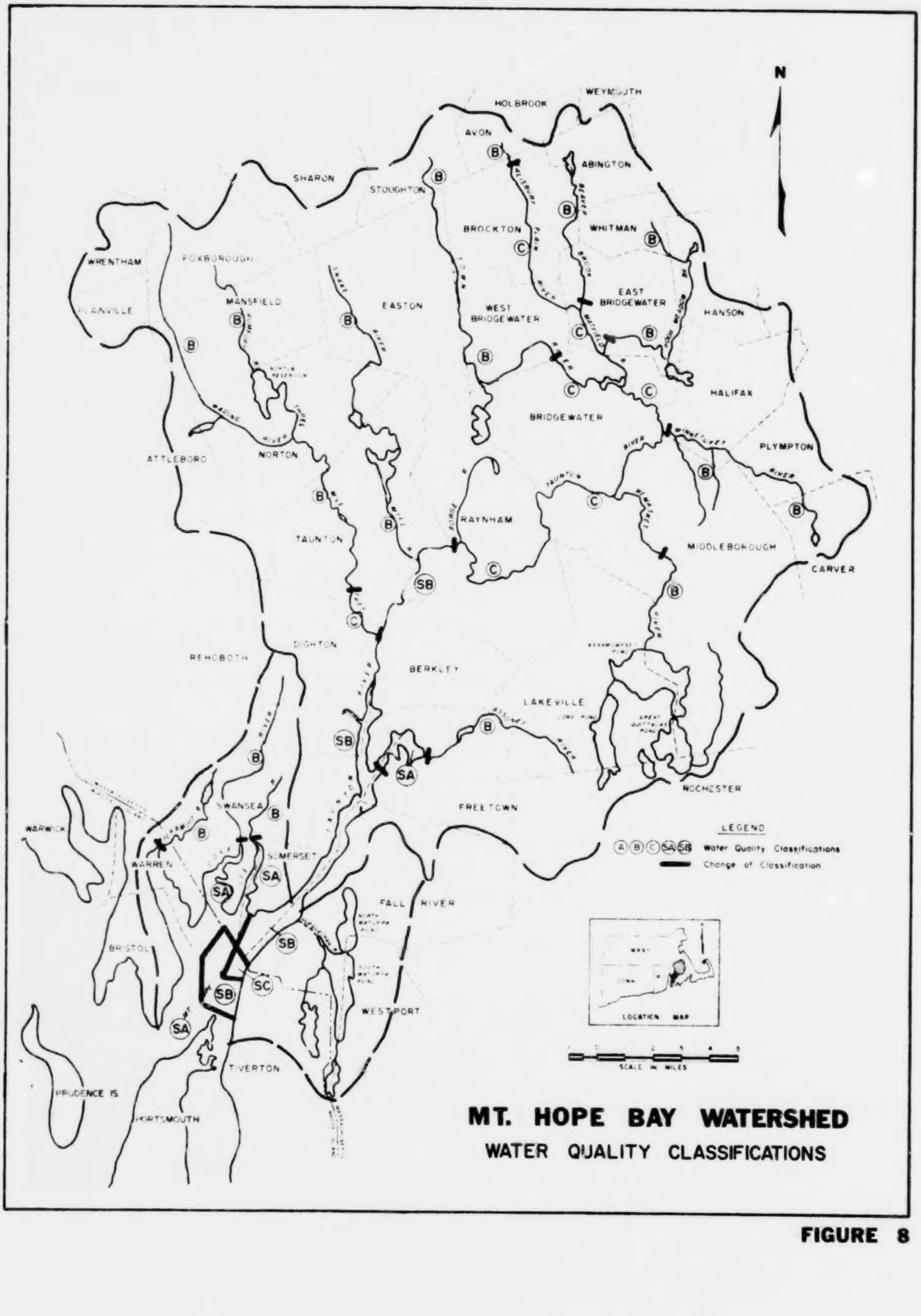
Another oil pollution problem is caused by the city of Fall River municipal sewers. Because this is a combined sewer system, oils that leak upon streets or other open surfaces are washed into the sewers during rainstorms and discharge through the overflow bypasses. Also, any oil draining to the city's municipal sewers is discharged during the overloaded conditions.

PRESENT WATER QUALITY AS RELATED TO STANDARDS

The discussion of effects of pollution in the watershed is based on Federal, State, and private studies performed in 1970 and limited biological surveys by EPA in 1971. Portions of those studies may be found in Appendices C, D, and E. Water quality classifications are shown in Figures 8 and 9, and the standard criteria may be found in Appendices A and B.

In Massachusetts, a Class B water has the following criteria:

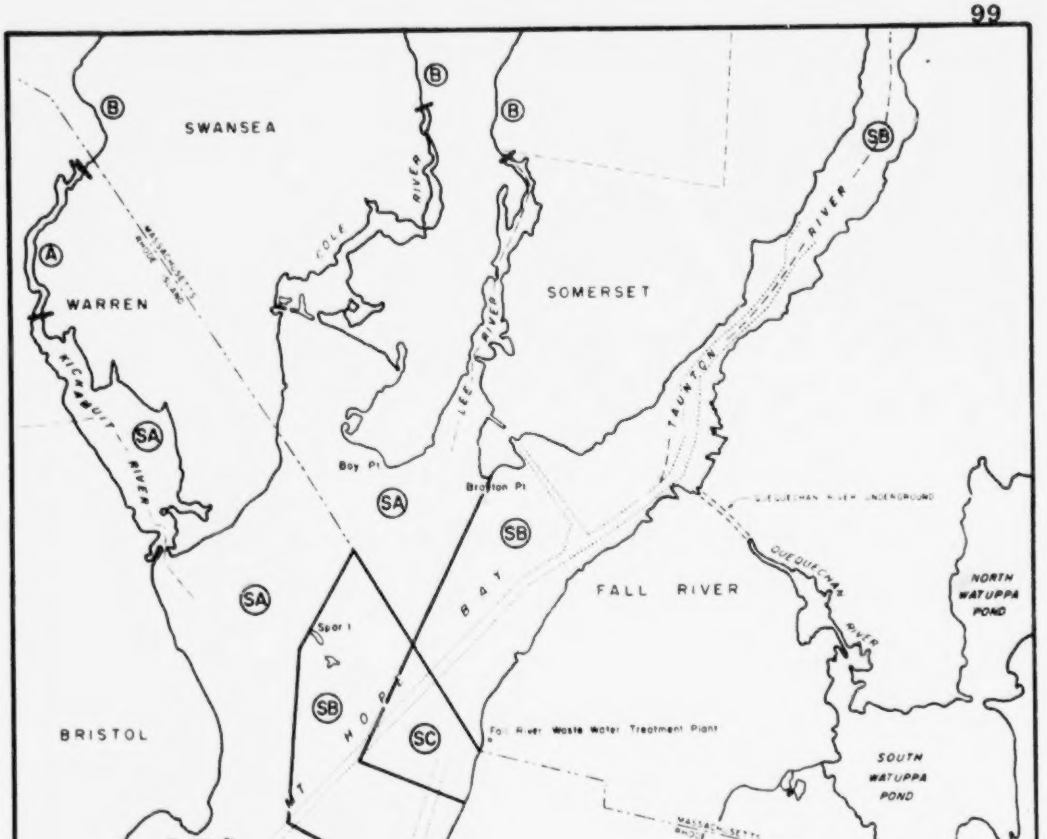
Dissolved oxygen must be 75 percent of saturation during at least 16 hours of any 24-hour period and not less than 5.0 mg/l at any time; sludge deposits, oils, refuse, solids are not allowed; coliform bacteria shall not exceed an average value of 1,000 per 100 ml during any monthly sampling period, nor 2,400 per 100 ml in more than 20 percent of the samples; temperature shall not increase, except where the increase will not exceed the recommended limit on the most sensitive receiving water use and in no case exceed 83 degrees Fahrenheit in warm-water fisheries and 68 degrees Fahrenheit in cold-water fisheries, or in any case raise the normal temperature of the receiving water more than 4 degrees


N
HOLBROOK
WEYMOUTH
AVON
ABINGTON
SHARON
STOUGHTON
BROCKTON
WHITMAN
WRENTHAM
FOXBOROUGH
MANSFIELD
EASTON
WEST BRIDGEWATER
EAST BRIDGEWATER
HANSON
PLAINVILLE
HALIFAX
BRIDGEWATER
ATTLEBORO
NORTON
PLYMPTON
RAYNHAM
TAUNTON
MIDDLEBOROUGH
CARVER
DIGHTON
REHOBOTH
BERKLEY
LAKEVILLE
ROCHESTER
SWANSEA
FREETOWN
WARWICK
WARREN
SOMERSET
FALL RIVER
BRISTOL
WESTPORT
TIVERTON
PRUDENCE IS.
PORTSMOUTH
A
B
C
SA
SB
SC
LEGEND
Ⓐ Ⓑ Ⓒ ⓈⒶ ⓈⒷ Water Quality Classifications
Change of Classification
LOCATION MAP
SCALE IN MILES

MT. HOPE BAY WATERSHED

WATER QUALITY CLASSIFICATIONS

FIGURE 8


SWANSEA
WARREN
SOMERSET
BRISTOL
FALL RIVER
TIVERTON
PORTSMOUTH
MASSACHUSETTS
RHODE ISLAND
KICKAMUIT RIVER
COLE RIVER
LEE RIVER
TAUNTON RIVER
QUEQUECHAN RIVER
QUEQUECHAN RIVER UNDERGROUND
SAKONNET RIVER
MT. HOPE BAY
NORTH WATUPPA POND
SOUTH WATUPPA POND
STAFFORD POND
Bay Pt
Brayton Pt
Spar I
Mt. Hope Pt
Common Fence Pt
Bristol Pt
Mt Hope Bridge
Fall River Waste Water Treatment Plant
LIMIT OF STUDY
LIMIT OF STUDY
A
B
B
B
SA
SA
SA
SA
SA
SB
SB
SB
SC
N
LEGEND
A Classification
Change of Classification
MASS
CONN
R.I.
LOCATION MAP
SCALE IN MILES

MT. HOPE BAY
WATER QUALITY CLASSIFICATIONS

FIGURE 9

Fahrenheit; total phosphate recorded as phosphorus shall not exceed an average of 0.05 mg/l during any monthly sampling period; and ammonia recorded as nitrogen shall not exceed an average of 0.5 mg/l during any monthly sampling period.

For Class C waters the following criteria apply:

Not less than 5.0 mg/l of dissolved oxygen must be maintained for at least 16 hours during any 24-hour period, nor less than 3 mg/l and for seasonal cold water fisheries 4.0 mg/l must be maintained; sludge deposits, oils, refuse, solids and scums are not allowed, except those amounts that may discharge from waste treatment facilities providing appropriate treatment; coliform bacteria concentrations cannot impair any usages assigned to this class. Temperature, total phosphate and ammonia criteria are those assigned to Class B waters.

The criteria for Class SA waters are:

Dissolved oxygen concentrations shall be 6.5 mg/l or greater; no sludge deposits, oils, refuse, solids or scums are allowed; coliform bacteria shall not exceed a median value of 70 per 100 ml and not more than 10 percent of the samples shall ordinarily exceed 230 per 100 ml during any monthly sampling period; no temperature increase shall exceed the recommended limits on the most sensitive water use; total phosphorus recorded as phosphorus shall not exceed an average of 0.07 mg/l during any monthly sampling period; and ammonia recorded as nitrogen shall not exceed an average of 0.2 mg/l during any monthly sampling period.

Criteria for waters having an SB classification state that:

DO concentrations shall not be less than 5.0 mg/l at any time; coliform bacteria concentrations shall not exceed a median value of 700 per 100 ml and not more than 2,300 per 100 ml in more than 10 percent of the samples during any monthly sampling period. Criteria for sludge deposits, oils, refuse, solids and scums; total phosphate; and ammonia are the same as for Class SA.

The State of Rhode Island's water quality standards are essentially the same as those outlined for Massachusetts, except DO for Class SA waters shall not be less than 6.0 mg/l any time, and Rhode Island specifies that coliforms shall be determined by the most probable number (MPN) method.

The Rhode Island criteria for SC waters are:

Dissolved oxygen shall not be less than 5.0 mg/l during at least 16 hours of any 24-hour period, nor less than 4.0 mg/l at any time; sludge is not allowed except that amount which may result from the discharge of a waste treatment facility providing appropriate treatment; temperature increases shall not exceed the recommended limits on the most sensitive water use assigned to this class.

PHYSICAL

SUSPENDED SOLIDS

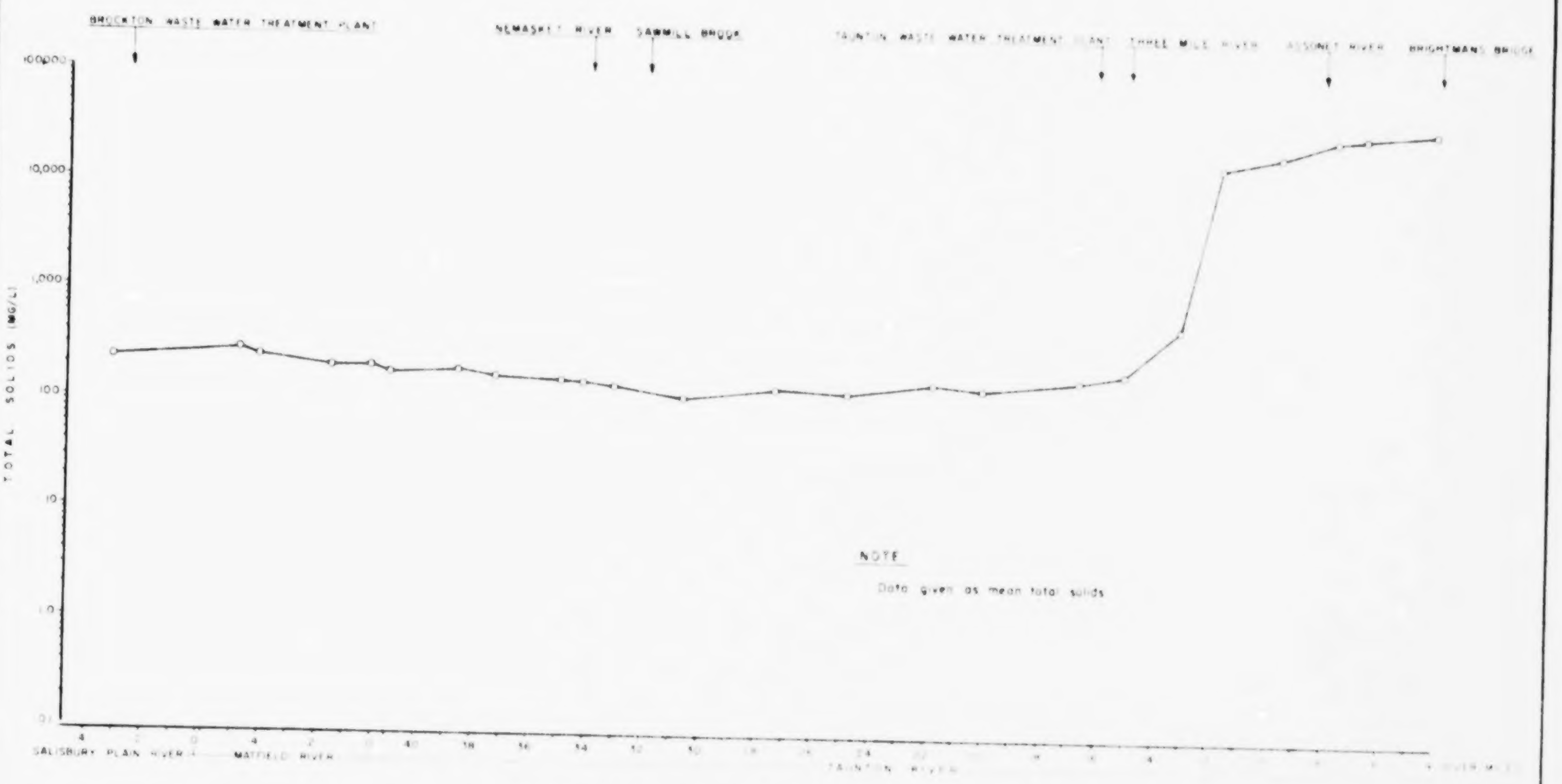
Downstream from the Brockton and Middleborough treatment plants, sludge blankets the bottom of the streambed. In the cooling pond downstream from the Brockton-Edison generating station in East Bridgewater, gas bubbles and sludge balls rise to the water's surface. These conditions violate the C classification assigned to the freshwater portion which states that no sludge deposits, solid refuse, floating solids, oils, grease, or scum are allowed, except those amounts that may result from the discharge from waste treatment facilities providing appropriate treatment.

Starting at the tidal limit of the Taunton River, floating oil, scum, sludge, and foams can be observed. These intensify as the river flows by Taunton, and often dead and putrefying fish dot the already bespeckled surface. Oil lends a glossy sheen to the water, and pipes along the bank spill raw sewage to the stream.

These conditions appear to lessen as the river broadens during its downstream passage, but as the waters approach the city of Fall River, degradation of the estuary intensifies. Brownish foams may be seen trailing in the effluent from the Montaup Power Company. Feces, paper, and other debris are visible in the boil of inadequately treated sewage from the Fall River treatment plant. Following rains, similar debris can be noticed along the Fall River shoreline and harbor areas.

The Quequechan River discharging to Fall River Harbor is laden with particulates from industrial discharges. Scientists from the National Marine Water Quality Laboratory report that at Brayton Point domestic wastes are being drawn into the generating station's cooling canal. These scientists observed planktonic and pelagic organisms being discharged from the effluent channel like hamburger or chopped liver.

The water quality conditions violate the SA and SB classifications which do not allow any sludge deposits, solid refuse, floating solids, oils, grease, or scums. Figure 10 represents the average concentrations of total solids in the Taunton River watershed.



MT. HOPE BAY WATERSHED
TOTAL SOLIDS
TAUNTON RIVER STUDY

FIGURE 10

TEMPERATURE

Temperature is an important regulator of natural processes in aquatic ecosystems. Changes in temperature control the physiological functions within the biosystem, both by altering the physical and chemical character of the environment and by directly affecting the life organs of aquatic animals and plants. Each species has its own unique thermal requirements, so that a given change in water temperature will have a broad range of effects upon the organisms within the water body, depending on species, age, sex, and history of exposure to various environmental conditions. Therefore, the thermal regime of an estuarine ecosystem, such as in Mount Hope Bay, controls the community structure and food chain relationships.[1, 2]

(1. Mackenthun, K. M. and L. E. Keup, "Assessing Temperature Effects with Biology." Proc. Am. Po. Conf., Vol. 31, 1969.

2. J. E. McKee and H. W. Wolf (Ed.), Water Quality Criteria (Second Edition; Sacramento, California: State Water Quality Control Board, 1963), P. 284.)

Elevated temperature, therefore, can have the following significant observable effects:

(1) decreased solubility of oxygen;

(2) increased metabolism and respiration, resulting in an increased demand for the dissolved oxygen;

(3) increased ability for enteric, pathogenic bacteria to survive in the water;

(4) increased toxicity of certain substances;

(5) inability of certain species' organs to function properly resulting in death; and

(6) a shift (rejuvenation) of the ecological composition in favor of "pollution-tolerant" organisms which are better able to compete for a given niche in the aquatic environment.

The thermal patterns in Mount Hope Bay, as in any such estuary, are variable due to the complex system of currents where the ocean flows through shoreline constrictions and mixes with the river water. Infrared aerial radiometry performed by Coastal Research Corporation in July of 1969 indicates that on an incoming tide the greatest portion of the flow enters the mouth of the Taunton River. While most of the flood follows the channel on the eastern side of the bay, a significant flow proceeds up the western shoreline, but veers to the east up the Taunton River just before reaching Brayton Point.

As a result of this phenomenon, a "hot spot" is formed in the middle of the bay, having temperature rises exceeding the 1.5-degree Fahrenheit rise in summer and the 4.0-degree Fahrenheit rise in winter, limits recommended by the National Technical Advisory Committee on Water Quality Criteria. This "hot spot" is virtually unaffected by the initial flooding tide. However, at high tide, sufficient mixing has occurred to remove this heated area.

The thermal plume patterns resulting from the discharge at the Brayton Point power station are illustrated in Appendix E. These isothermal diagrams are based on studies at Alden Research Laboratory, Worcester Polytechnic Institute, where a physical model of the upper bay has been constructed. These diagrams demonstrate that with the present discharge a "thermal block" is created in the Lee River, whereas the proposed effluent configuration, as shown in Figure 22, Appendix E, discharges the heat with great momentum directly into the bay.

Although it is expected that the proposed discharge will have less effect on the Lee River and that the maximum plume temperatures near the outfall will be reduced by virtue of increased dilution, the zone of thermal influence will be enlarged significantly.

Therefore, a greater portion of the estuarine population will be affected by temperature rises on the order of 1.5 degrees Fahrenheit during the summer.

With the new discharge and the increased pumping of dilution water, there will be a greater tendency for water to recirculate around Brayton Point before complete cooling is achieved. The Alden Laboratory model predicts that about 1.5 degrees Fahrenheit rise of the intake water temperature will occur as a result of recycling.

The design of this model, however, is intended to demonstrate the effects of the heated discharge on the near-field waters only. The model is incapable of detecting a gradual "buildup" of heat within Mount Hope Bay.

During the summer of 1959, some 4 years prior to the initial operation of the Brayton Point generating station, the U. S. Public Health Service performed an extensive water quality survey of Upper Narragansett Bay. A comparison of this data with that from the 1970 State-Federal sampling program indicates that an increase in the bay temperature of about 7.5 degrees Fahrenheit had occurred from August of 1959 to August of 1970. Of this, about a 0.7-degree Fahrenheit rise is attributable to the Taunton River, less than 2.0 degrees Fahrenheit appears due to higher atmospheric temperatures, and approximately 1.8-degrees Fahrenheit increase was recorded for the waters of lower Narragansett Bay. The increase of about 3.0 degrees Fahrenheit cannot be attributed to any obvious natural causes and must be the result of discharges of artificially heated water. Such an elevation in temperature exceeds the summer temperature criteria recommended by the National Technical Advisory Committee on Water Quality Criteria.

During August of 1970, water temperatures in excess of 90 degrees Fahrenheit were recorded at beaches on the west side of the Lee River. Based upon complaints from local citizens and their own studies, the Massachusetts Division of Water Pollution Control issued an abatement order to the New England Power Company on October 16, 1970. The order states that the power company shall abate the discharge of untreated or inadequately treated wastes from facilities under its control and construction of the abatement facilities shall be completed by September 1, 1971. The abatement facilities are behind schedule.

A report on the Brayton Point Environmental Study by Raytheon Company stated that, as of summer 1969 (shortly after Unit No. 3 became operational), "extensive growth of vegetation and algae were not encountered." However, during the next summer it was reported that massive growth of attached algae, predominantly sea lettuce, had begun to cover both shores of the Lee River in the thermally-affected areas. In June of 1971 this vegetation again appeared, first in the Lee River, then in the Cole River.

Several fish kills which have been reported during 1971 were apparently due to the attraction of certain finfishes (menhaden, silverside, etc.) to the heated water which was periodically dosed with chlorine. In the area of the heated plume several animal species have proliferated. These species include mussels (*Mytilis edulis*) and barnacles (*Balanus sp.*). However, in late spring or early summer when water temperatures in the existing canal are sustained above 81 degrees Fahrenheit, the mussels are killed.

Mount Hope Bay has one of the highest phytoplankton productivities in New England. Rates of carbon fixation and concentration of chlorophyll-a are roughly comparable to certain "eutrophic" coastal waters in the Southeastern United States. Concentrations of the primary nutrients, nitrogen (N) and phosphorus (P), are well above the limits of 0.2 mg/l as N and 0.07 mg/l as P established by the Massachusetts federally-approved water quality criteria for SA and SB waters.

Although algal blooms occur in the bay, none has yet reached nuisance proportions. The potential for such nuisance blooms exists, and the discharge of heated water at Brayton Point adds considerably to this possibility.

As Naylor indicates, "Artificially heated regions in temperate waters (are)...more prone to occurrence of (algal) blooms." (Naylor, E. "Effects of Heated Effluents upon Marine and Estuarine Organisms" in Adv. Mar. Biol. Vol. 3, 1965, pp. 63-103.)

CHEMICAL

BIOCHEMICAL OXYGEN DEMAND AND DISSOLVED OXYGEN

The oxygen demand of sewage and industrial wastes, as measured by the biochemical oxygen demand (BOD) test, indicates the potential for reducing the dissolved oxygen (DO) content of streams. If the DO is reduced below an adequate level, shellfish, finfish, and the zooplankton on which the higher forms of aquatic life feed are killed or driven out of the area.

The Massachusetts water quality standards for Class C, the lowest classification for maintaining a fish habitat, state that DO concentrations shall not be less than 5.0 mg/l during at least 16 hours of any 24-hour period, nor less than 3.0 mg/l at any time. For cold-water fisheries at least 5.0 mg/l must be maintained.

If the dissolved oxygen becomes totally depleted, obnoxious odors, mostly from hydrogen sulfide, result. The hydrogen sulfide given off by the streams may discolor nearby houses, bridges, or other painted structures.

In some cases, dissolved oxygen concentrations in Mount Hope Bay exhibited values above expected maximum concentrations. When such conditions occur, the water is said to be supersaturated with oxygen. Supersaturation usually results from large populations of phytoplankton. Under normal conditions, phytoplankton, primarily algae, produce oxygen by photosynthesis and utilize oxygen during respiration. During the daylight hours, oxygen production exceeds the demand for respiration, and the excess oxygen goes into solution. If hydrologic conditions are favorable and enough phytoplankton are present, the water's theoretical DO saturation point can be exceeded.

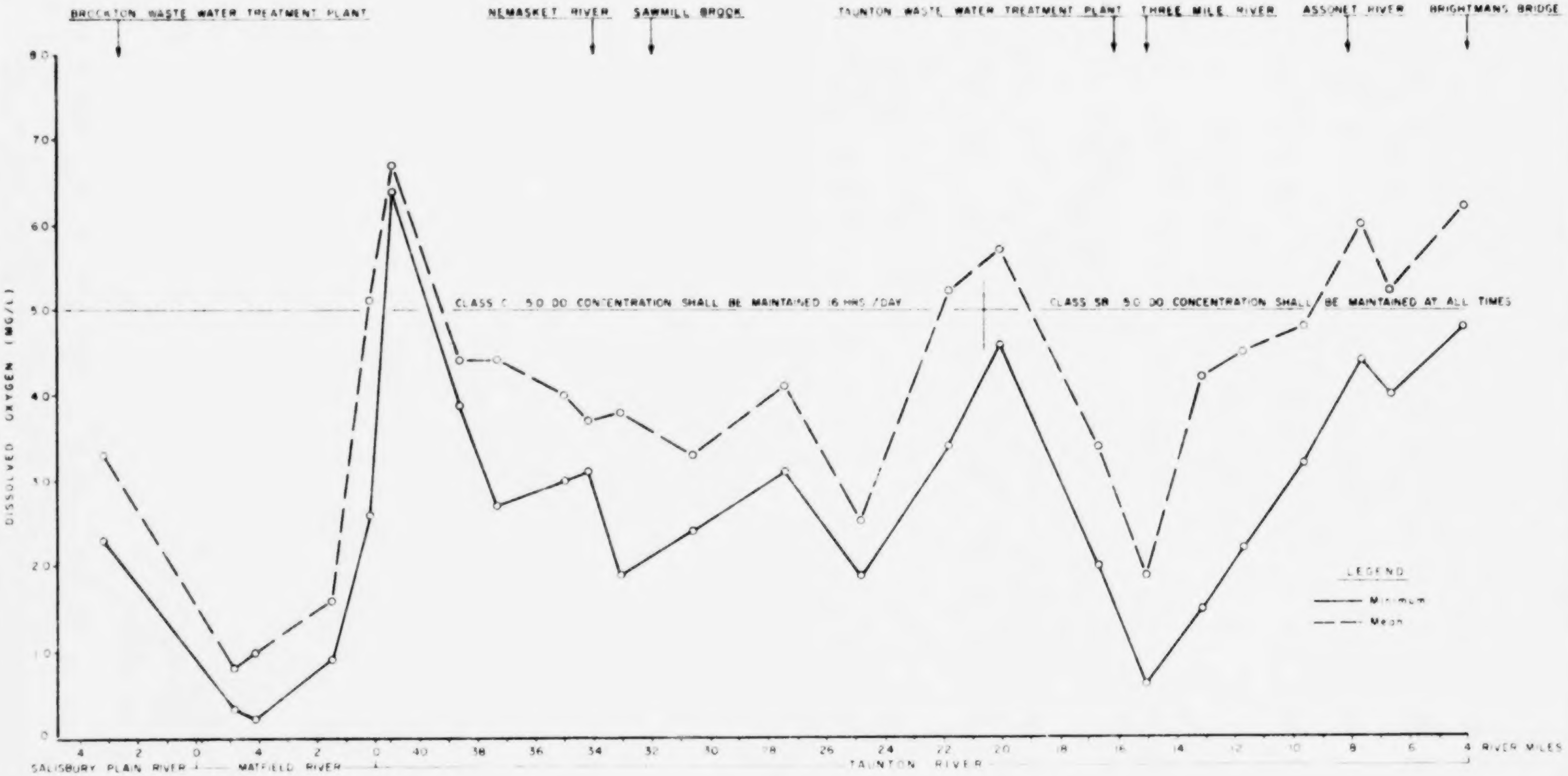
In other instances and sometimes at the same stations exhibiting supersaturated conditions, dissolved oxygen concentrations fell below minimum allowable values.

The fluctuations are indicative of large concentrations of algae and periods of strong BOD loadings.

In the Taunton River Basin, wastes from municipal treatment plants and industrial discharges keep oxygen levels depressed. Downstream from the Brockton wastewater treatment plant dissolved oxygen concentrations do not exceed 3.0 mg/l until the confluence of the Matfield and Town Rivers. Oxygen concentrations in the Taunton River are substandard from the river's origin to its confluence with the Three Mile River. From the Middleborough treatment plant to the confluence with the Taunton River, concentrations in the Nemasket River are less than 3.0 mg/l.

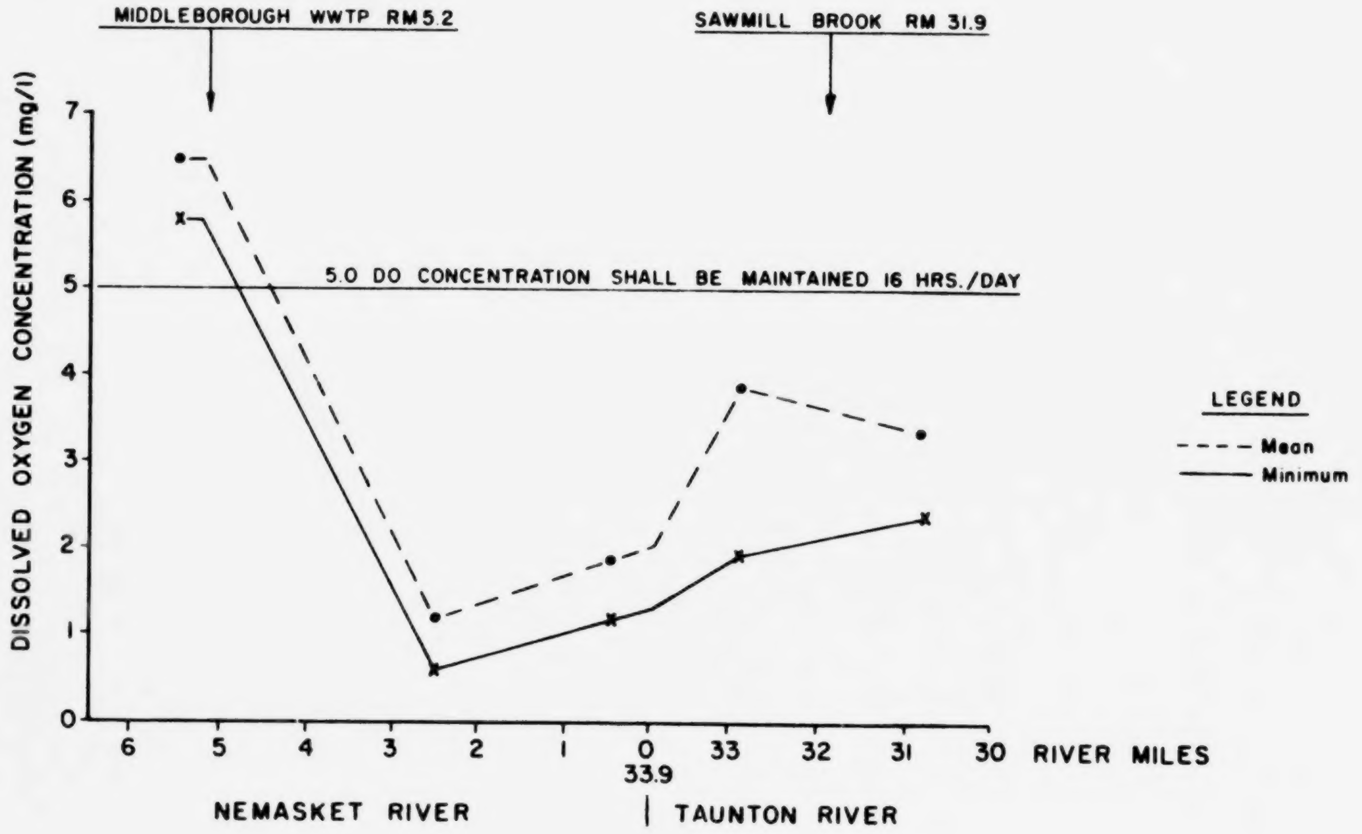
In the tidal portion of the river, near the Taunton treatment plant, dissolved oxygen concentrations dropped to near zero. The fact that the plant is primarily responsible for the low DO is demonstrated by data showing that the lowest conditions prevailed at the station upstream from the plant at high tide and at the downstream station at low tide (see stations 35-41, Appendix D).

Figures 11 and 12 show the DO concentrations downstream from Brockton, Taunton, and Middleborough.



MT. HOPE BAY WATERSHED
DISSOLVED OXYGEN CONCENTRATIONS
TAUNTON RIVER STUDY

FIGURE 11



DISSOLVED OXYGEN vs. RIVER MILES
MIDDLEBOROUGH WASTE WATER TREATMENT PLANT

FIGURE 12

A study of Mount Hope Bay performed in August 1970 (see Appendix C) shows that only one of the stations in the Massachusetts section of the bay met the federally-approved Massachusetts water quality criteria which state that DO concentrations in SA waters shall not be less than 6.5 mg/l and not less than 5.0 mg/l in Class SB waters. Compliance was achieved only at high tide. In the Rhode Island portion of the bay, stations sampled at low tide were not consistently above the minimum allowable DO concentration of 6.0 mg/l as specified in the federally-approved Rhode Island water quality standards.

NUTRIENTS

Nutrients, in terms of water quality, are the chemicals which stimulate growth of plants and are usually phosphorus and nitrogen compounds in the water. If large amounts of nutrients are present in water and climatological conditions are favorable, excessive plant growths can occur. The large growths can block light and oxygen penetration and can prohibit germination of other plant life.

Besides physically choking a stream or water body, at night, when oxygen is not being produced, respiring algae exert an oxygen demand on the stream which depletes the dissolved oxygen. Large algal blooms, which exhaust the oxygen during respiration, die and create a substantial BOD load in the stream and serve as an additional source of nitrogen and phosphorus during the decaying process.

Other problems associated with upsetting the nutrient balance in a stream are toxicity and specie · elimination. Since each organism thrives best on a certain nutrient balance, adding nutrients to the water can upset this balance. Such an upset can kill the natural species and develop new species, or cause specie to become predominant.

Such a condition exists in Mount Hope Bay. During the summer months, coccoid green and blue-green algae, species at the bottom of the food web and inedible for filter-feeding invertebrates, predominate.

Limited laboratory studies indicate that algae require from 0.01-0.05 mg/l of available phosphorus to propagate. Because there is no set relationship between available phosphorus and total phosphorus in water, a general guideline for allowable amounts of total phosphorus in water is 0.10 mg/l for rivers and 0.05 mg/l where streams enter lakes and impoundments.

Myron O. Knudson

The Report of the National Technical Advisory Committee on Water Quality Criteria states:

> "The nitrogen-phosphorus ratio is also of importance. The ratio varied with the water, season, temperature and geological formation, and may range from 1 or 2:1 to 100:1. In natural waters, the ratio is often very near 10:1, and this appears to be a good guideline for indicating normal conditions." (National Technical Advisory Committee, Water Quality Criteria (Washington, D. C.: Federal Water Pollution Control Administration, 1968), p. 53.)

The federally-approved Massachusetts water quality standards have established the following limits on total phosphate concentrations:

Classes B and C, "Not to exceed an average of 0.05 mg/l as phosphorus during any monthly sampling period."

Classes SA and SB, "Not to exceed an average of 0.07 mg/l as phosphorus during any monthly sampling period."

The standards also established the following limits on ammonia:

Classes B and C, "Not to exceed an average of 1.0 mg/l as nitrogen during any monthly sampling period."

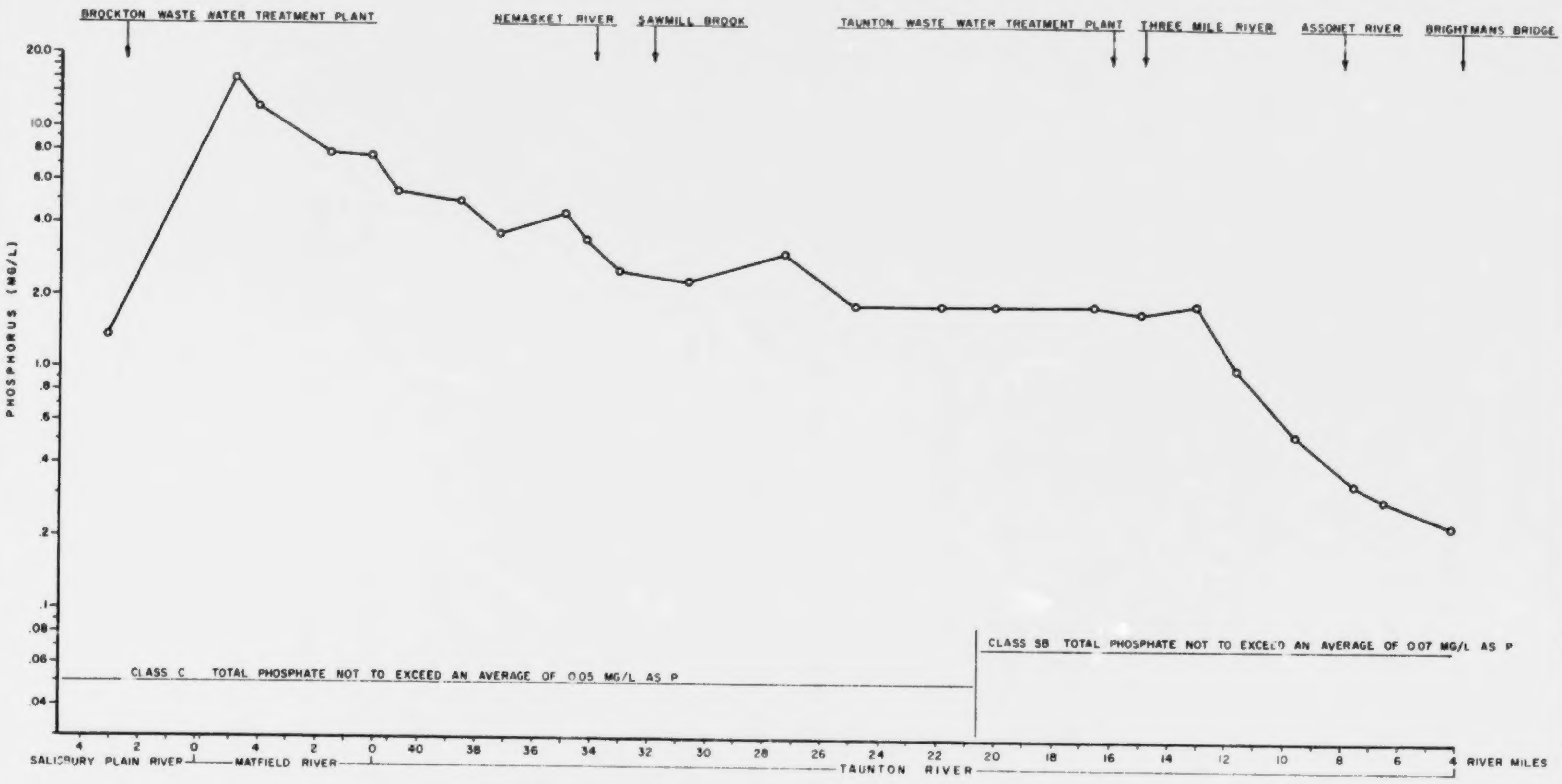
Classes SA and SB, "Not to exceed an average of 0.2 mg/l as nitrogen during any monthly sampling period."

The data gathered during the Taunton River survey in 1970 indicate that "normal" nutrient conditions do not exist (see Appendix D). From Brockton, Massachusetts to Brightman's Bridge near the mouth of the Taunton River, the allowable limits were exceeded and abnormal conditions persisted.

Figures 13 and 14 show the mean concentrations of total phosphorus and ammonia in that portion of the drainage basin. Figure 15 shows algae counts over the same area verifying that entrophic conditions exist.

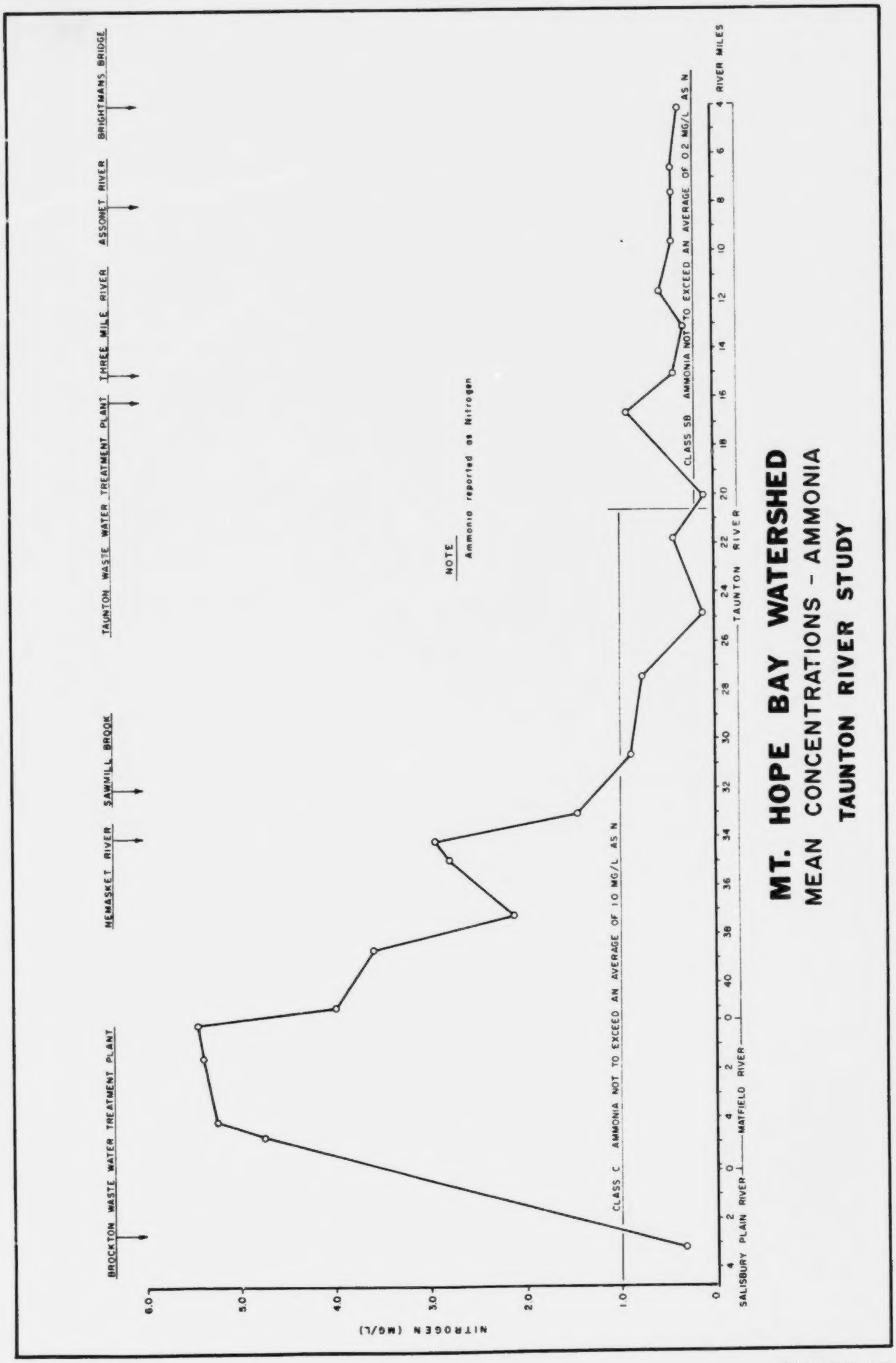
BACTERIOLOGICAL

Water polluted by wastes from warm-blooded animals and humans frequently contains pathogenic bacteria. Because of the presence of pathogens, ingesting raw or partially cooked shellfish can cause gastrointestinal diseases such as typhoid fever and dysentery. The infectious hepatitis virus and other viruses may also be transmitted. Body contact with water polluted by bacteria can also cause eye, ear, nose, throat, and skin infections. Therefore, bacterial pollution of water presents a health



MT. HOPE BAY WATERSHED
MEAN TOTAL PHOSPHORUS
TAUNTON RIVER STUDY

FIGURE 13

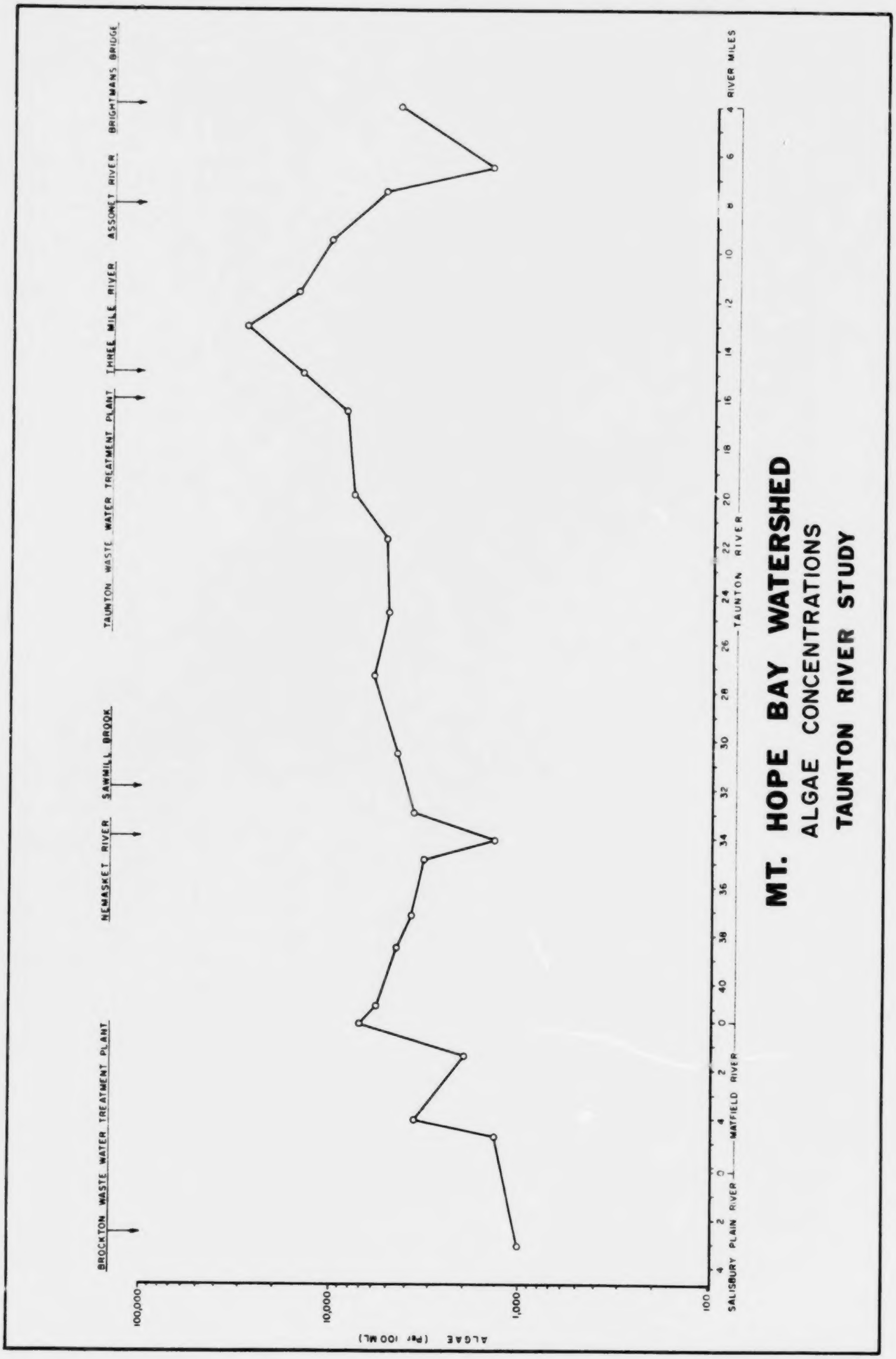


MT. HOPE BAY WATERSHED

MEAN CONCENTRATIONS - AMMONIA

TAUNTON RIVER STUDY

FIGURE 14



MT. HOPE BAY WATERSHED
ALGAE CONCENTRATIONS
TAUNTON RIVER STUDY

FIGURE 15

hazard, not only to those who come in contact with it, but also to those who may eat shellfish taken from the waters.

The chain of disease transmission by pathogenic bacteria from human waste through shellfish which are eaten raw or insufficiently cooked has been well established. In an attempt to control such disease transmission, the National Shellfish Sanitation Program was established in 1925. This is a cooperative program between the States, the Public Health Service, and the shellfish industry, with its goal to safely use the valuable shellfish resources. The Massachusetts and Rhode Island Departments of Public Health use the guides set forth in the National Shellfish Sanitation Manual of Operations, Part I, to properly classify the suitability of estuarine waters for shellfish harvesting. A restricted classification requires that the harvested shellfish be depurated to reduce bacterial densities.

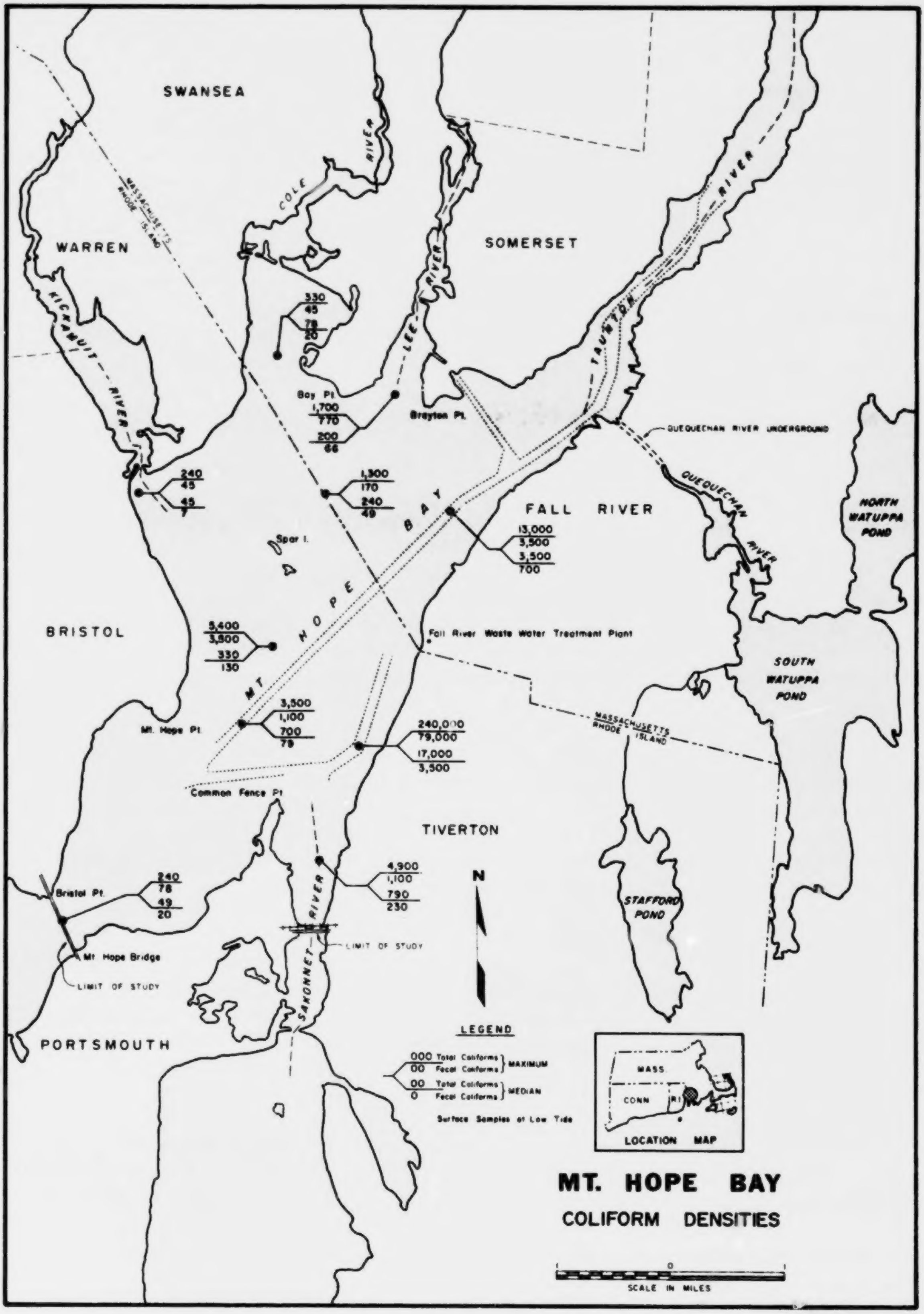
Sewage and some industrial wastes also contain bacteria of the coliform group, which typically occur in excreta or feces of warm-blooded animals. Coliform bacteria are readily detectable. Although most are harmless in themselves, they are always present in waters polluted by warm-blooded animal wastes and are considered indicators of pathogenic bacteria. The Commonwealth of Massachusetts and the State of Rhode Island use total coliform counts as indicators of bacterial contamination in classified waters.

Mount Hope Bay, because of combined sewer overflows and inadequately treated wastes from the Fall River outfall, has very high coliform concentrations along the east shore. Figure 16 shows the maximum and median of total and fecal coliform densities sampled at ebb tide.

To compensate for bacterial contamination from the Fall River outfall, Rhode Island set low water quality standards in the vicinity of the outfall; however, much of the bay water does not meet the federally-approved State water quality standards.

The Rhode Island standards specify that using the most probable number (MPN) method, coliform bacteria per 100 ml are not to exceed a median MPN of 70 and not more than 10 percent of the samples shall ordinarily exceed an MPN of 230 for a five-tube decimal dilution or 330 for a three-tube dilution.

For SB water, the criteria state that densities per 100 ml are not to exceed a median value of 700 and not more than 2,300 in more than 10 percent of the samples.


SWANSEA
WARREN
SOMERSET
BRISTOL
FALL RIVER
TIVERTON
PORTSMOUTH
MASSACHUSETTS
RHODE ISLAND
COLE
RIVER
LEE RIVER
TAUNTON RIVER
KICKAMUIT RIVER
QUEQUECHAN RIVER UNDERGROUND
QUEQUECHAN RIVER
NORTH WATUPPA POND
SOUTH WATUPPA POND
STAFFORD POND
SAKONNET RIVER
MT HOPE BAY
Spar I.
Bay Pt.
Brayton Pt.
Fall River Waste Water Treatment Plant
Mt. Hope Pt.
Common Fence Pt.
Bristol Pt.
Mt Hope Bridge
LIMIT OF STUDY
LIMIT OF STUDY
N
330
45
79
20
1,700
770
200
66
240
45
45
7
1,300
170
240
49
13,000
3,500
3,500
700
5,400
3,500
330
130
3,500
1,100
700
79
240,000
79,000
17,000
3,500
240
78
49
20
4,900
1,100
790
230
LEGEND
000 Total Coliforms
00 Fecal Coliforms
MAXIMUM
00 Total Coliforms
0 Fecal Coliforms
MEDIAN
Surface Samples at Low Tide
MASS.
CONN
RI
LOCATION MAP
0
SCALE IN MILES

MT. HOPE BAY
COLIFORM DENSITIES

FIGURE 16

Most of the Mount Hope Bay stations sampled during August 1970 violated the criteria for SB and SA waters.

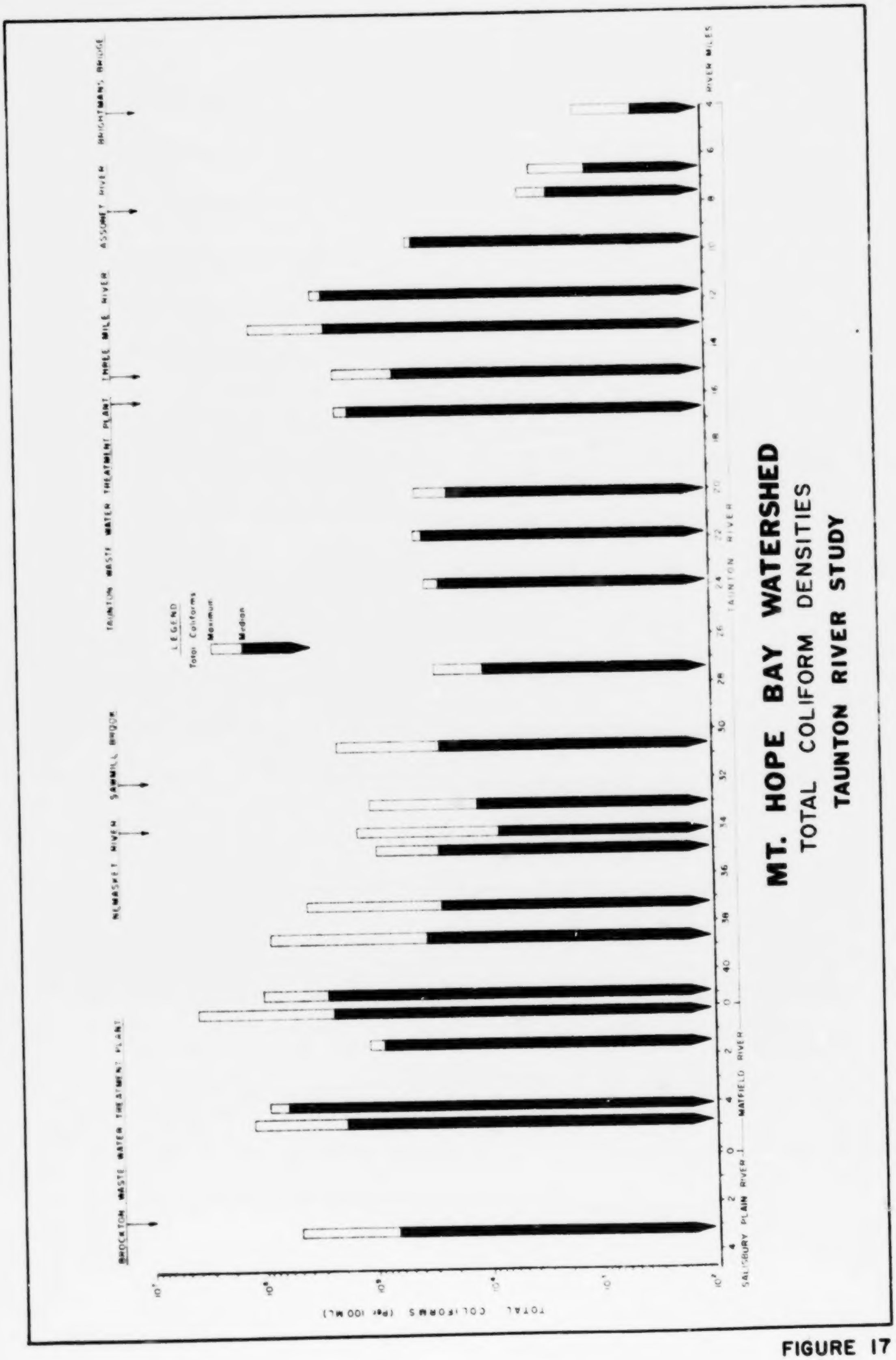
In Massachusetts, the coliform criteria for SA waters do not specify using the MPN method, but establish the same limits, ordinarily 70 coliforms per 100 ml median, and ordinarily not more than 230 in not more than 10 percent of the samples. The SB classification is the same as that for Rhode Island, except that the methodology is not specified. Again, these criteria, with the possible exception of the Cole River, are violated throughout the bay and most of the estuarine waters.

In the Taunton River from the mouth of the river to upstream of Taunton, the coliform limit, a median value of 700/100 ml, is generally exceeded. In the entire Taunton River Basin, total coliform counts are seldom less than 10,000/100 ml.

Figure 17 shows selected median coliform densities in the Taunton River watershed.

BIOLOGICAL

On the basis of recent studies performed by the National Marine Water Quality Laboratory, West Kingston, Rhode Island, phytoplankton, zooplankton, and productivity values indicate that a very rich condition



MT. HOPE BAY WATERSHED
TOTAL COLIFORM DENSITIES
TAUNTON RIVER STUDY

FIGURE 17

exists in the waters around Brayton Point. Diatoms and flagellates are the dominant phytoplankton forms.

In the Lee River, attached macro-algae are flourishing. Their success in this area can be directly attributed to water temperature and an abundant nutrient supply. An excessive growth of these plants may upset the ecological balance of the area because such a growth can eliminate more desirable forms of algae and other biota essential for the successful propagation of shellfish.

Of note is the growth of a large number of pollution-tolerant organisms and the paucity of several clean water species. Analysis by EPA's New England Basins Office, Needham, Massachusetts, of the kinds and numbers of bottom organisms from Stations 1A, 6, 7, 9, and EC (see Figure 18) indicated organic enrichment of bottom sediments. Station 5 in the Lee River contained less soft mud and more gravel, sand and shells, probably because of the effluent flow from the Brayton Point generating station that continuously scours the substratum. Fewer bottom organisms were found at Station 5 than at the other stations.

Four species of pollution-tolerant polychaete worms were present in the bottom mud at Station EC,

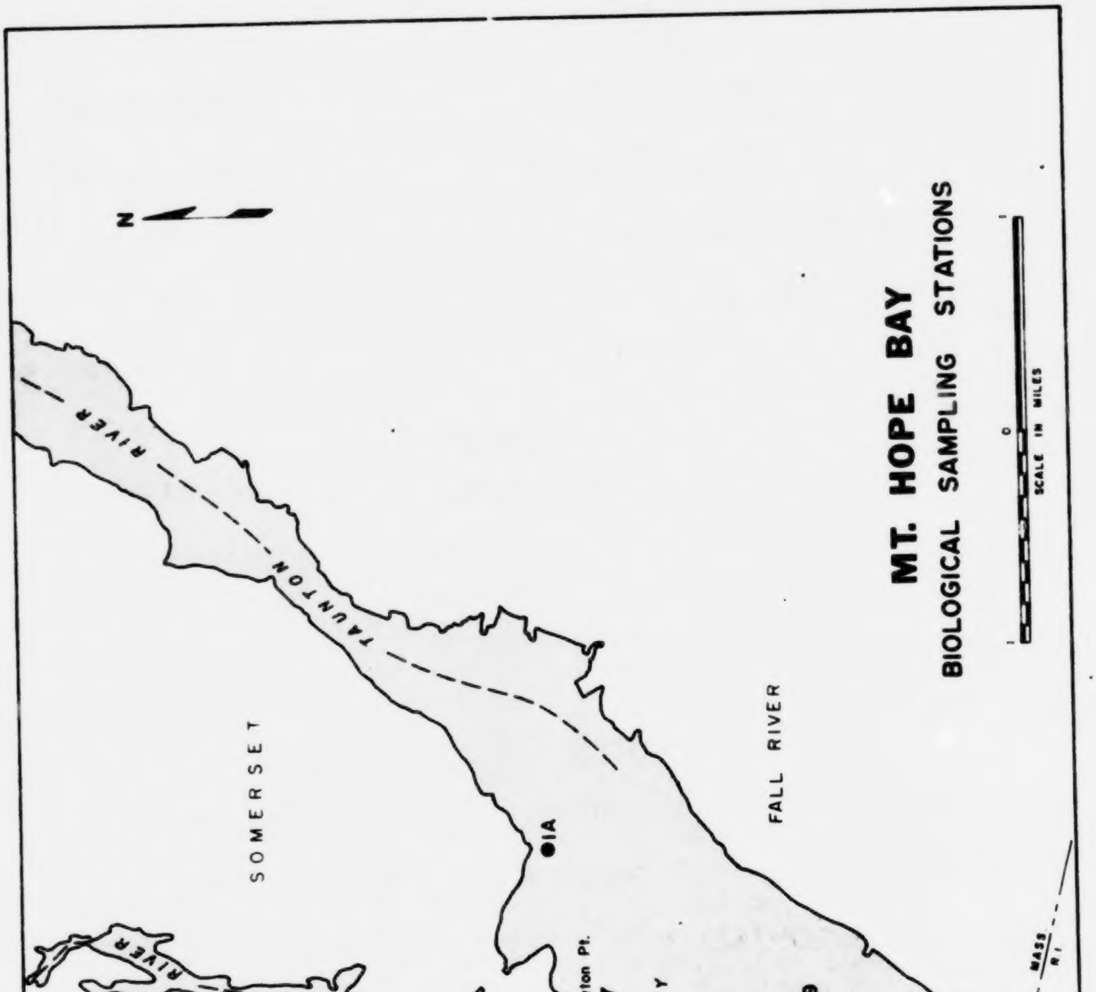

MT. HOPE BAY
BIOLOGICAL SAMPLING STATIONS
N
SCALE IN MILES
0
1
SOMERSET
FALL RIVER
SWANSEA
WARREN
TAUNTON RIVER
LEE RIVER
COLE RIVER
MT. HOPE BAY
Brayton Pt.
Bay Pt.
Spar I.
MASS.
R.I.
1A
5
EC
6
7
9

FIGURE 18

located approximately 20 feet north of the mouth of the effluent channel. They were the two spionids, *Streblospio benedicti* (48,560 per square meter) and *Polydora ligni* (6,027 per square meter) which are sedentary ciliary feeding worms that ingest organic nutrients from the substratum and overlying water.

The capitellid *Capitella capitata* (13,776 per square meter) is a burrowing polychaete worm that obtains nutrition from organic matter mixed with sand and mud that they ingest.

Nereis succinea (172 per square meter) were also found here. These organisms were also found during pollution studies in other areas. *Polydora ligni* and *Capitella capitata* were dredged from grossly polluted substratums in Boston Harbor. *Nereis succinea* was the only life form found in a polluted area of the Seekonk River, Rhode Island. *Microdrilid oligochaetes* (37,884 per square meter) were present here in the greatest number of the stations sampled. A large number of filter-feeding, minute soft-shelled clams (23,419 per square meter) were in the sample. This indicated that the overlying water is organically enriched.

These unusually high numbers of marine invertebrates found at Station EC are comparable in magnitude to the tubificid worms found below a raw sewage outfall in the freshwater environment.

Polychaete worm populations that exceed a density of 200 per square foot in marine waters of Boston Harbor are considered indicative of excessive enrichment. (Stewart, Keith R., Biological Aspects of Water Quality, Charles River and Boston Harbor, Mass., 1967 Federal Water Pollution and Control Administration, Technical Advisory and Investigations Branch, 5555 Ridge Avenue, Cincinnati, Ohio.)

Ampelisca spinipes which feed on organic debris are found in numbers (see Table 10) greater than those polychaetes found in Boston Harbor. These amphipods indicate organic enrichment in the vicinity of Brayton Point.

EFFECTS OF POLLUTION ON WATER USES

SHELLFISHERIES - 1971

The States of Rhode Island and Massachusetts are both participating members of the National Shellfish Sanitation Program. This is a cooperative program of Federal, State, and industry effort to preserve and safely manage a natural resource.

In general, the program obligates each member State to adopt adequate laws for sanitary control of the

TABLE 10

MT. HOPE BAY

Benthic Organisms/Sq. Meter

December 1970 - June 1971

Station No. Date Sampled	1A 12-16-70	5 12-16-70	6 12-16-70	7 12-16-70	9 12-16-70	EC 6-11-71	5 3-12-71
Polychaetes							
Pectinaria gouldii	130		490		231		29
Sabella crassicornis	14						
Polydora ciliata	115						
Sabella microphthalma	14						
Glycera dibranchiata	808		634	29			
Lumbrineris tenuis	29						29
Podarke obscura	880		361	317			202
Spiochaetopterus oculatus	678		288	29			
Phyllodoce groenlandica			14				
Glycera americana			14		144		
Scoloplos robustus			159				
Eulalia bilineata			43				
Eulalia viridis				29			
Streblospio benedicti						48,560	
Polydora ligni						6,027	
Nereis succinea		Q				172	
Capitella capitata						13,776	144
Goniadidae family				87	519		
Hydroides dianthus		Q					
Syllis gracilis		Q					
Unknown				952	202		144

TABLE 10(Continued)

Station No. Date Sampled	1A 12-16-70	5 12-16-70	6 12-16-70	7 12-16-70	9 12-16-70	EC 6-11-71	5 3-12-71
Amphipods							
Ampelisca spinipes	20,621		10,397	23,591	30,080		
Corophium volutator	72	Q	14	346	288	2,239	87
Amphithoe longimana							29
Bivalves							
Lyonsia hyalina	87						
Nucula proxima	14	Q	216	4,586	3,172		
Mya arenaria	130	Q				23,419	
Spisula solidissima			606				
Yoldia limatula				144	202		
Pandora gouldiana					58		
Mercenaria mercenaria		Q			173	172	
Ensis directus						517	
Tellina agilis							29
Gastropods							
Acteon punctostriatus	764		115		606		
Nassarius trivittatus	87		231	144	87		
Retusa caniculata	130		101	260	865		
Odostomia bisuturalis			72	173	87		
Crepidula fornicata			43				
Turbonilla interrupta				317			
Nassarius obsoletus						1,550	
Hydrobia sp.			58				
Cumaceans	808		389	260	606		

TABLE 10(Continued)

Station No.	1A	5	6	7	9	EC	5
Date Sampled	12-16-70	12-16-70	12-16-70	12-16-70	12-16-70	6-11-71	3-12-71
Isopods							
Edotea triloba	29			87	317		
Crabs							
Neopanope texana		Q					29
Rhithropanopeus harrisi		Q					
Eurypanopeus depressus		Q					
Penopeus herbsti							29
Sea Spiders							
Anaplodactylus lentus					115		
Shrimp							
Heteromysis formosa					29		
Marine oligochaetes							
Microdrilids	15,545	Q	6,792		115	37,884	3,230
Phascolosoma sp.				29			
Phascolion strombi					58		
Starfish							
Asterias forbesi	14						
Flatworms							
Triclad planarians				115			

TABLE 10 (Continued)

Station No. Date Sampled	1A 12-16-70	5 12-16-70	6 12-16-70	7 12-16-70	9 12-16-70	EC 6-11-71	5 3-12-71
Sea anemones							
Metridium senile		Q					260
Haliplanella luciae		Q					
Bryozoan							
Electra crustulenta		Q					
Copepod							29

shellfish industry. It requires the States to make sanitary and bacteriological surveys of growing areas and to delineate and patrol closely those areas where shellfish harvesting has been prohibited. The States must also inspect shellfish treatment plants, shellstock and shucker-packer dealers, and transplant areas, and to initiate control measures necessary to ensure that shellfish reaching the consumer have been grown, harvested, and processed in a sanitary manner.

Shellfish closures in Rhode Island and Massachusetts are made by the Departments of Public Health of the respective States. Shellfish beds are closed to direct market harvesting when an evaluation of sanitary surveys shows that bacterial limits for overlying shellfish waters are exceeded and that actual or potential sources of pollution are harming the estuaries containing the shellfish grounds. Other factors, such as hydrographic conditions, and the presence of pesticides and radionuclides, are also considered.

Shellfish surveys conducted by marine officials of Massachusetts and Rhode Island show that the bay and the four rivers contain different species of shellfish in varying densities. These are the soft-shell clam (*Mya arenaria*), the Eastern oyster (*Crassostrea virginica*), and the hard clam (Mercenaria mercenaria).

State records show that Mount Hope Bay, except for the Kickamuit River and a portion of the Cole River, has been closed to direct market shellfish harvesting over the past 20 or more years because of high bacterial levels, although the rivers carry separate classifications.

The Cole River in Massachusetts contains two closed shellfish areas: (1) that portion of the river north of Wilbur Avenue, and (2) a small area east of the island in a cove adjacent to the Ocean Grove section in Gardner Neck of Swansea.

The Lee River and most of Mount Hope Bay in Massachusetts are classified as restricted for shellfish depuration only.

The closed shellfish areas apply to all of the Taunton River and the bay shores of Fall River.

In addition to 2,950 acres of depuration area in Massachusetts, there are over 6,000 acres of closed shellfish areas in both States.

Figure 19 shows the classification of shellfish areas.

In Massachusetts, depuration is an approved method established for the cleaning of soft-shell clams taken from moderately polluted waters. Shellfish taken

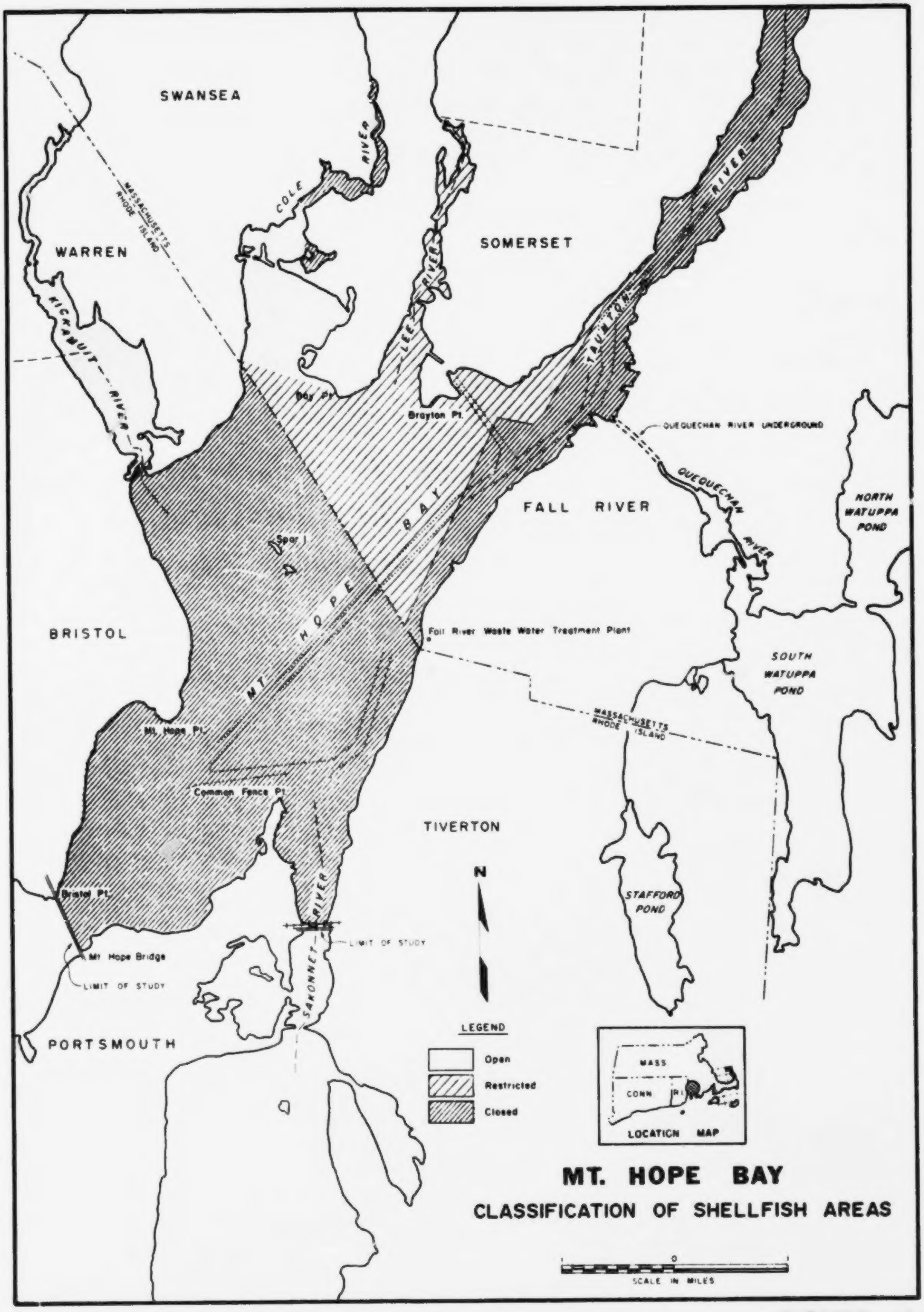

SWANSEA
SOMERSET
WARREN
COLE RIVER
LEE RIVER
TAUNTON RIVER
KICKAMUIT RIVER
MASSACHUSETTS
RHODE ISLAND
Bay Pt.
Brayton Pt.
QUEQUECHAN RIVER UNDERGROUND
QUEQUECHAN RIVER
FALL RIVER
NORTH WATUPPA POND
SOUTH WATUPPA POND
Spar I.
MT. HOPE BAY
BRISTOL
Fall River Waste Water Treatment Plant
Mt. Hope Pt.
Common Fence Pt.
TIVERTON
N
STAFFORD POND
Bristol Pt.
Mt. Hope Bridge
LIMIT OF STUDY
LIMIT OF STUDY
SAKONNET RIVER
PORTSMOUTH
LEGEND
Open
Restricted
Closed
MASS
CONN
RI
LOCATION MAP
MT. HOPE BAY
CLASSIFICATION OF SHELLFISH AREAS
0
SCALE IN MILES

FIGURE 19

for depuration are managed under strict State supervision from the moment of harvest to final release from the plant.

Rhode Island does not have provisions in the law nor facilities for shellfish depuration. The State, however, promotes and administers a shellfish transplant program by taking shellfish (hard clams) from moderately polluted waters and placing them in clean waters to undergo natural cleansing. The program is administered by the Department of Public Health which is responsible for the quality of the shellfish, and the Department of Natural Resources which finances the project and supervises the actual movement of the shellfish from one area to another.

For a number of years, Rhode Island has supervised transplant programs in a number of places throughout Rhode Island waters, including Mount Hope Bay. The program is significant in that a natural resource is reclaimed and utilized. Otherwise, the resource would lie dormant, unclaimed, and wasted.

Rhode Island records show that three major transplants occurred in Mount Hope Bay during the years 1963, 1964, and 1966. Shellfish removed from Mount Hope Bay were placed into three areas: (1) Island Park, (2) beds A and B off Tiverton, and (3) the Barrington

River.

Over 42,000 bushels of hard clams were initially harvested by eight to 14 dredge boats in 68 working days and placed in clean waters. Upon meeting satisfactory requirements of the Department of Public Health, the shellfish were then released to the market. Generally, the Department of Natural Resources pays the fishermen $1.00 for each bushel of polluted clams, and the fishermen pay in a range of $2.25 to $2.75 per bushel for reharvested clams.

During this period, 52 percent or 22,700 bushels were reharvested for market use from the original stock of 42,100 bushels. Hard clams that come under the so-called "chowder" class, 3 inches or more from the length axis, are worth $5.00 per bushel, and 60 to 70 percent of the shellfish in Mount Hope Bay is in the chowder class.

In 1969 Rhode Island State officials plotted and surveyed an acre site south of the Jamestown Bridge in the West Passage to determine shellfish density populations for an average portion of the West Passage dredge grounds. Information available from the State shows that the shellfish density in Mount Hope Bay is similar to the distribution found in the West Passage of Narragansett Bay. Therefore, data in the survey report on the hard clam commercial dredge season in West Passage served as the baseline for computing a standing crop of hard clams in Rhode Island waters of Mount Hope Bay. The study disclosed a mean of 38.5 bushels of hard clams per acre.

In projecting the hard clam population for Mount Hope Bay, calculations using the mean 38.5 bushels per acre of the plotted area times the 5,700 acres of Rhode Island shellfish beds gave a figure of 219,450 bushels. A blanket coverage over the total acreage is not realistic; therefore, a 20 percent reduction (assumed) is applied to compensate for irregularity in density contouring. This would leave an adjusted 175,560 bushels. This standing crop of hard clams for the Rhode Island side of Mount Hope Bay would yield a landed market value of about $878,000 at $5.00 for an 80 pound/bushel pack.

Since 1963, Rhode Island has completed three transplant programs from Mount Hope Bay with a production of 22,750 bushels of chowder size market clams. The yield from this polluted area has realized a reclaiming of a natural resource in the amount of $91,000, after deductions of $1.00 per bushel to the State for repurchasing the shellfish prior to market sale.

The estuarine study group of the Massachusetts Division of Marine Fisheries provided survey data for shellfish population estimates of Mount Hope Bay, including the Taunton and Lee Rivers, and the upper Cole River. Survey data indicated that there are eight shellfish beds in the Taunton River, ranging in sizes from about 11 to 36 acres. These beds are scattered in pockets extending northerly from Somerset to Muddy Brook in Dighton and consist mostly of planted oyster stock, except for two soft-shell clam areas in Somerset and Bryant's Neck in Assonet.

Examination of the soft-shell clam areas disclosed many seeds and sublegal sizes, i.e., less than 2 inches. Measurements taken in five of the eight shellfish grounds showed the presence of oysters ranging in densities of one to three oysters per square foot. A projected crop of 26,100 bushels of marketable oysters was estimated as the yield of the shellfish grounds in the Taunton River covering about 115 acres with a landed value of $237,500.

Massachusetts officials classified the Lee River and most of Mount Hope Bay for restricted use. Actually, the area can be considered a shellfish closure because State records show no harvesting in the area whatsoever.

Myron O. Knudson

The survey team listed nine shellfish areas covering about 288 acres of the Lee River where density calculations were made. One bed had a mixed population of soft and hard clams, whereas the remainder consisted of hard clams.

Densities of the hard clams in the respective beds ranged from four to 22 clams per square foot, mostly in the chowder class, while the only soft clam area had a figure of three per square foot. In all cases, the sizes were within the legal harvesting limits covering 91 to 100 percent.

An area comprising about 207 acres south of Brayton Point in Mount Hope Bay was not directly surveyed, but the information obtained indicated that it contained hard clams in densities similar to Rhode Island. On this basis, the calculation of hard clams in the area showed a standing crop of 8,100 bushels with a landed value of $40,400.

Estimates of 270 acres in the Lee River showed that the value of 202,700 bushels of hard clams, most of which are of legal size in the chowder class, carried a landed value of $1,013,200. The survey also indicated that a soft-shell clam bed, about 18 acres, east of the powerplant, carried a landed value of $10,600 from a projected figure of 1,300 bushels.

The Cole River is closed to shellfishing from the Wilbur Avenue Bridge northward to its headwaters. Three shellfish beds were surveyed and identified in the closed grounds north of the bridge. These beds contained hard clam densities ranging from one to four per square foot. One of the beds, in addition to hard clams, also had legal-size soft clams amounting to 1,800 bushels and valued at $14,000 in 10 acres. The three beds, about 69 acres, contained 24,300 bushels of legal-size hard clams with a landed value of $107,600 based on the price of chowder sizes.

In all, the estimated standing crop value of the Massachusetts shellfish resources totals $1,423,300, representing over 4,000 acres of shellfish grounds.

Marine fisheries officials from Rhode Island and Massachusetts reported that the catch of lobsters and crabs from Mount Hope Bay is extremely limited and that there are no records of commercial production.

Table 11 shows that 42 percent of the shellfish were located in the bay areas of both States and that 58 percent of the remaining sources were in the rivers.

WATER SUPPLY

Southeastern Massachusetts needs to develop new water supplies to meet the demand anticipated by 1990.

TABLE 11

POTENTIAL VALUE* OF SHELLFISH RESOURCES IN CLOSED AND DEPURATION AREAS OF MT. HOPE BAY, RHODE ISLAND AND MASSACHUSETTS, 1971

State	Area	Acres	Specie	Size in Inches	No. Legal Bushels	Estimated Value in $	% Shellfish Value Each Area
Rhode Island	Mt. Hope Bay	5,700	Hard Clams	3+	175,600	878,000	38
Massachusetts	Mt. Hope Bay	3,611	Hard Clams	3+	8,100	40,400+	2
Massachusetts	Taunton River	115	Oysters	3+	26,100	237,500	10
Massachusetts	Cole River	69	Hard Clams	3+	24,300	107,600	5
Massachusetts	Cole River	10	Soft Clams	2+	1,800	14,000	Less than one
Massachusetts	Lee River	270	Hard Clams	3+	202,700	1,013,200	45
Massachusetts	Lee River	18	Soft Clams	2+	1,300	10,600	Less than one
Totals		9,793			439,900	2,301,300	100

*Landed value of harvester or producer shipper

+Value based on a dense area representing 207 acres.

The Rhode Island areas contiguous to the district are currently experiencing water shortages. In 1970, the Fall River water supply, which serves portions of North Tiverton, Rhode Island, did not meet Public Health Service standards for drinking water because of taste, odor, and color.

The area's largest surface supply is the Lakeville Pond Complex which serves as the principal source for Taunton. North Watuppa Pond is the source of Fall River's domestic supply. South Watuppa Pond and Noquochoke Lake, which lies outside the Mount Hope drainage basin, supplies industrial water to the city.

Inventories of water supply sites in southeastern Massachusetts revealed that many of the watercourses were polluted and that marsh and swamp lands generally caused color and taste problems in these waters. The suitability of the selected river and stream sites for water supply is contingent upon pollution abatement and enforcement of State water pollution control regulations.

Three of the more promising sites lie within the Taunton River Basin. They are: (1) enlargement of the storage at the Lakeville Pond complex; (2) damming of the Winnetuxet River near the confluence with the Taunton; and (3) damming the Taunton River near the confluence with the Assonet River.

RECREATIONAL BOATING

Recreational boating is a very important aspect of Mount Hope Bay. Aesthetically, the open water is appealing, and the diversity of sport fisheries encourages boating activities.

The Fall River marina is the only major boat service on the bay. Most boaters utilizing Mount Hope Bay have private moorings or utilize those available at yacht clubs, marinas, and boat yards in the estuaries.

In the Taunton estuary, boat facilities are available as far upstream as the city of Taunton. Boat owners in the upper estuary complain of excessive maintenance caused by oils, scums, and corrosive agents in the water.

COMMERCIAL BOATING

Commercial boating is limited to tankers, colliers, and freighters servicing the electric power stations, industries, and oil terminals around Fall River. The shallow channel restricts the size of vessels that may traverse the bay. The Corps of Engineers is seeking to increase the channel depth to allow larger tankers to negotiate the bay at all tides. Nineteen commercial piers, including a port of entry, are located on the bay.

SPORT FISHING

Sport fisheries are an asset to the area. Species such as striped bass, blue fish, black fish, and flounders abound in the bay. Blue fishing in the vicinity of the Brayton Point effluent canal has been termed excellent in recent years. Pollution in the Taunton River estuary has restricted the growth of a good sport fishery. Periodically, large numbers of dead fish may be seen floating in the vicinity of Taunton.

In the freshwater reaches of the Taunton River, low dissolved oxygen concentrations prevent sustained fish life; however, some sport fishing is done in the Three Mile River, the Wading River, and the Hockomock River.

SWIMMING

Although most of Mount Hope Bay and the entire Taunton River estuary have classifications that permit swimming, excessively high coliform counts are found in concentrations violating the Massachusetts recreational standard of 700 per 100 ml. More apparent is the presence of the oil, scum, dead fish, and debris that drift along the surface and discourage many bathers. In the Lee River, bathers complain that the tepid water created by discharged cooling waters is unappealing.

MOUNT HOPE BAY

SUMMARY

CONCLUSIONS

1. Mount Hope Bay is a valuable natural resource which must be maintained in the best possible condition if it is to be used and enjoyed by future generations.

2. Pollution of Mount Hope Bay and surrounding estuaries adversely affects finfish, shellfish, and other aquatic life, despoils beaches and shorefront properties, interferes with recreational uses, and impairs the general aesthetic enjoyment of the bay area.

3. Commercial shellfish areas in both the Massachusetts and Rhode Island portions of the bay are closed to the harvesting of shellfish for direct human consumption or market purposes as a result of high bacterial levels in the water or their proximity to sources of pollution. Currently, the total potential value of the shellfish resources in the closed and restricted areas of Mount Hope Bay in Massachusetts and Rhode Island is over $2 million.

4. Water quality standards, including criteria and implementation schedules, have been established to

preserve and protect the waters of Mount Hope Bay and its tributaries. Recent reports and surveys show that the waters of Mount Hope Bay, the Taunton River, the Matfield River, the Salisbury Plain River, and the Lee River do not meet the federally-approved water quality criteria of Massachusetts and Rhode Island.

5. While State programs are securing abatement, there are waste sources in the conference area in violation of federally-approved implementation plans and schedules. In addition, there are a number of waste sources in the conference area which are not on federally-approved impelmentation schedules.

6. A primary source of bacteria in the affected waters is the discharge of inadequately treated domestic wastes from Brockton, Taunton, Middleborough, and Fall River and overflows of raw sewage from combined sewers in Fall River and Taunton. Evidence of severe bacterial contamination has been found by the Commonwealth of Massachusetts and the Environmental Protection Agency throughout the Taunton River Basin. Violations of federally-approved State criteria for bacteria were found throughout Mount Hope Bay.

7. The small quantity of oxygen normally dissolved in water is perhaps the most important single

ingredient necessary for a healthful, balanced aquatic life environment. The discharge of inadequately treated municipal wastes with their high biochemical oxygen demand (BOD_5) has resulted in seriously low levels of dissolved oxygen in violation of the federally-approved water quality criteria in many areas of the Mount Hope Bay watershed. Studies show that these areas are the Salisbury Plain River, Matfield River, and Taunton River.

8. High oxygen demanding loads from Fall River, Brockton, Taunton, and Middleborough wastewater treatment plants; George O. Jenkins No. 2 Mill, Bridgewater; Defiance Manufacturing, Norton; Geilich Tanning Company, Harodite Finishing Company, and Dyecraftsman, Inc., Taunton; and Parks Corporation, Somerset, contribute significantly to the pollution of the watershed. Heavy metals and toxic chemicals which are emitted from Reliable Electroplating and S & D Plating, Norton; New England Brass Company, Reed & Barton Corporation, Ronco Enterprises, Royce Aluminum Corporation, Sheridan Silver Company, Taunton; Swan Finishing Company, Swansea; and Imperial Chemical Industries of America, Dighton, also contribute significantly to the pollution of the watershed.

No Federal installations are known to discharge pollutants to receiving waters in the Mount Hope Bay watershed.

9. Most of the Mount Hope Bay watershed has high nutrient levels which exceed federally-approved State water quality standards. High concentrations of phosphorus and nitrogen in the bay, together with elevated bay temperatures, represent a significant potential for unnatural algal blooms which threaten the usefulness of the bay for this and future generations.

10. Thirteen minor oil spills, less than 1,000 gallons, occurred in the Mount Hope Bay area between January and June 1971. The potential exists for oil discharges from industrial plants and commercial ships and the careless loading and unloading of cargoes to despoil beaches and other recreational areas, damage shorefront property, coat hulls of pleasure boats, and have deleterious effects upon fish and other aquatic life.

11. The waste effluent from fly ash lagoons and materials leaching from drying sludge at New England Power Company's Brayton Point generating station are contributing excessive concentrations of heavy metals -- nickel, vanadium, etc. -- to the Lee River and Mount Hope Bay.

12. Both sport and commercial fishes in the vicinity of the Lee River and Brayton Point have been killed by the discharge of toxic materials. Other fish kills have been observed in the Taunton River.

13. Dredging benthic materials from Mount Hope Bay can create an environment hazardous to the biota in Mount Hope Bay. Disposal of polluted spoil material in the open ocean waters will degrade the water's quality and endanger aquatic life.

14. Metal-laden sludges from Imperial Chemical Industries of America have accumulated in Muddy Cove Brook lagoon and are an ever-present danger to the aquatic environment. These sludges continually leach mercury to the Taunton River via Muddy Cove Brook.

15. Resident and migratory fishes in the Taunton River between Taunton and Fall River contain high concentrations of mercury. Because of the severity of the conditions, the Massachusetts Department of Public Health issued a warning against eating any fish taken from the Taunton River between the two cities.

16. The historic circulation patterns in Mount Hope Bay have been changed by New England Power Company's Brayton Point generating station. Refuse from Fall River, which is being drawn into the generating station,

degrades the Lee River. The sediments of the Lee River near the Brayton Point discharge location are highly organic in composition and are characterized by a low-diversity benthic community predominated by "pollution-tolerant" species. Extensive growths of attached algal forms have begun to appear (in the summer) along the shoreline at the mouths of the Lee and Cole Rivers since the power station's third unit became operational. Over the past two summers, large numbers of finfish have been killed in the plant's discharge channel. Water temperatures in excess of 90 degrees Fahrenheit have been experienced at swimming areas in the Lee River. The Commonwealth of Massachusetts has received many complaints from bathers because of these high temperatures.

The operations of the New England Power Company at Brayton Point violate federally-approved water quality standards at the present time. Suitable modifications must be made so as to bring this facility into compliance.

17. Wastes discharged in Massachusetts cause the pollution of Mount Hope Bay endangering the health and welfare of persons in Massachusetts and Rhode Island. The pollution is subject to abatement under provisions of section 10 of the Federal Water Pollution Control Act,

as amended (33 USC 1160).

RECOMMENDATIONS

It is recommended that:

1. All municipalities discharging wastes to receiving waters within the Mount Hope Bay watershed provide a minimum of secondary treatment for all their wastewaters. Further, it is recommended that Brockton and Middleborough, Massachusetts upgrade their existing wastewater treatment plants above secondary treatment to provide adequate removal of oxygen-demanding material and nutrients. Also, a technical advisory committee should be appointed to investigate the feasibility of installing interim treatment facilities for phosphate removal and report to the conferees within 6 months. Secondary treatment is defined as that which provides a minimum of 85 percent reduction of both suspended solids and oxygen-demanding material as measured by the 5-day biochemical oxygen demand (BOD_5) test. Adequate nutrient removal is that removal necessary to meet water quality standards 500 feet downstream from the treatment plant outfall.

2. All waste sources discharging domestic wastes to receiving waters in the Mount Hope Bay watershed provide adequate year-round disinfection of their wastewater effluents.

Myron O. Knudson

3. All industrial waste sources provide as a minimum the equivalent of secondary treatment for biodegradable organic wastes.

4. Municipal and industrial sources in the Mount Hope Bay watershed are to meet the following criteria for the wastes discharged:

a. Substantially complete removal of oil (in whatever state, including free, emulsified, dispersed and dissolved oils), debris, scum and other floating materials. Under no circumstances should a total net oil concentration exceed 10 mg/l.

b. Reduction of suspended solids, dissolved solids, and other materials to such degree that the discharge will not produce turbidity, color, or odor in the river, or impart taste to potable water supplies or cause the tainting of fish flesh. The net concentration of suspended solids shall not exceed 30 mg/l.

c. pH as discharged shall be such as to meet established stream criteria; in no event shall pH as discharged be outside the limits of 6.0 and 9.0 standard units.

d. Reduction or elimination or any and all constituent materials to such a degree that the concentration thereof, singly or in combination, in any discharge is not harmful to human health.

e. Reduction or elimination of any material, or, if necessary, all materials, contained in any discharge which singly or in combination are toxic or harmful to aquatic life. Wastewaters are considered toxic if over half the test organisms are fatalities in a 96-hour bioassay.

f. Industrial waste sources connected to municipal systems provide the necessary and appropriate pretreatment to prevent damage to the sewers or the municipal wastewater treatment plant.

5. All recommended treatment facilities be completed and in operation by December 31, 1974, except where earlier completion is required by water quality standards. Interim dates for all waste sources in the conference area are to be submitted to the conference chairman within 3 months. States should take appropriate action to conform State implementation schedules to the dates in the federally-approved water quality standards.

6. Fall River, Taunton, and Brockton complete a preliminary engineering report by December 1973 with recommendations for the solution to the problem of

combined sewer overflows. Following this report, the Massachusetts Division of Water Pollution Control should establish an implementation schedule for each municipality.

7. The mercury-laden sediments in Muddy Cove Brook lagoon be physically removed, with removal to continue until the remaining sediment contains a mercury concentration of 0.1 ppm or less. To minimize the possibility of mercury-rich sediments being lost to the Taunton River, the following safeguards be provided prior to the removal operation:

a. The flow in Muddy Cove Brook be diverted from the lagoon at a point upstream of the plant and all wastes from the plant be diverted from the lagoon, with both the plant wastes and flow from the brook discharged downstream from the hurricane barrier.

b. Modifications be made at the existing hurricane barrier to insure segregation of the lagoon from the Taunton River.

c. The excavated sludge be transported to an ultimate disposal site that will reasonably guarantee no additional environmental contamination.

The conferees appoint a technical advisory committee charged with determining a practical method of sludge disposal which will best protect the environment.

8. Companies accepting oil shipments in and about Mount Hope Bay should develop a rapid and functional oil spill response system.

9. The fly ash dumps at New England Power Company's Brayton Point station be removed and disposed of in a sanitary landfill. Any drainage from the dumping area and lagoons be contained or treated until the heavy metal concentrations are reduced to acceptable levels. A concentration of 1.0 mg/l in wastewater will be considered an acceptable level for any heavy metal unless a more stringent requirement presently exists or is found necessary.

10. All new facilities and proposed expansions of existing thermal electric powerplants in the watershed include facilities for offstream cooling throughout the year.

11. The Environmental Protection Agency develop and pursue a research program which will clearly show the effects that the thermal, municipal, and industrial wastes have upon the biota of Mount Hope Bay. Such a study should include thermal mapping of the bay, a qualitative and quantitative determination of the resident and migratory fishes in the bay, mapping the

current patterns, and an investigation of the benthic plants, animals, and plankton in their natural environment, and the effects of toxicants upon important species of the area.

12. The Environmental Protection Agency, the States, and the interstate agencies are developing a water quality management program for Mount Hope Bay and its tributaries. The program is evaluating alternatives and recommending specific programs, including financial and organizational arrangements, to secure long-term compliance with the water quality standards, and a management scheme to protect the watershed for future uses.

The program should include, but not be limited to, the following:

a. Determination of areas of critical value for recreation and for finfish and shellfish production, and of measures for restoring these areas or protecting them from future encroachments.

b. Alternate municipal and industrial waste collection and treatment systems.

c. Review of the location and design of powerplants.

d. Disposal of dredged material, sludge, and other wastes.

e. Financial, organizational, and legal arrangements for implementing recommended actions.

None of these activities shall be construed as superseding the existing water quality standards implementation schedules.

13. Any Federal construction or operating permit for the New England Power Company facilities at Brayton Point shall be suitably conditioned to insure that environmental standards are met at all times. In addition, the circulating water intake structure shall be designed to minimize the entrainment of estuarine organisms into the cooling water system.

MASSACHUSETTS WATER QUALITY CRITERIA

COMMONWEALTH OF MASSACHUSETTS

WATER RESOURCES COMMISSION

DIVISION OF WATER POLLUTION CONTROL

WATER QUALITY STANDARDS

Adopted by the Massachusetts Division of Water Pollution Control on March 3, 1967, in accordance with the Provisions of Section 27 (4) of Chapter 21 of the General Laws, and in accordance with the procedure required by Chapter 30A of the General Laws, and after a public hearing held on February 17, 1967

Filed with Secretary
of State On
March 6, 1967

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Standards of Water Quality

1. General - To achieve the objectives of the Massachusetts Clean Water Act and to assure best use of the waters of the Commonwealth, the following standards are adopted and shall be applicable to all waters of the Commonwealth or to different segments of the same waters. The Classes shall be assigned by the Division of Water Pollution Control.

In the classification of waters due consideration will be given to all factors involved including public health, public enjoyment, propagation and protection of fish and wildlife, and economic and social development. Classifications are not intended to permit indiscriminate waste disposal or to allow minimum efforts of waste treatment under any circumstance.

When an effluent is permitted to be discharged to the receiving waters, cognizance shall be given both in time and distance to allow for mixing of effluent and stream. Such distances required for complete mixing shall not affect the water usage Class adopted.

Recommendations on other waste parameters will constitute a portion of the continuing effort of the Division as improved standard methods are developed or revisions consistent with the enhancement of the waters of the Commonwealth are justified.

Water quality parameters not specifically denoted shall not exceed the recommended limits on the most sensitive and governing water class use. In areas where fisheries are the governing consideration and approved limits have not been established, bio-assays shall be performed as required by the appropriate agencies.

Standards of Water Quality

Fresh Waters

Class A - Waters designated for use as public water supplies in accordance with Chapter 111 of the General Laws. Character uniformly excellent.

Standards of Quality

Item	Water Quality Criteria
1. Dissolved oxygen	Not less than 75% of saturation during at least 16 hours of any 24-hour period and not less than 5 mg/l at any time.
2. Sludge deposits-solid refuse-floating solids-oil-grease-scum	None allowable
3. Color and turbidity	None other than of natural origin
4. Coliform bacteria per 100 ml.	Not to exceed an average value of 50 during any monthly sampling period.
5. Taste and odor	None other than of natural origin
6. pH	As naturally occurs
7. Allowable temperature increase	None other than of natural origin
8. Chemical constituents	None in concentrations or combinations which would be harmful or offensive to humans, or harmful to animal, or aquatic life.
9. Radioactivity	None other than that occurring from natural phenomena

Class B - Suitable for bathing and recreational purposes including water contact sports. Acceptable for public water supply with appropriate treatment. Suitable for agricultural, and certain industrial cooling and process uses; excellent fish and wildlife habitat; excellent aesthetic value.

Standards of Quality

Item	Water Quality Criteria
1. Dissolved oxygen	Not less than 75% of saturation during at least 16 hours of any 24-hour period and not less than 5 mg/l at any time.
2. Sludge deposits-solid refuse-floating solids-oils-grease-scum	None Allowable
3. Color and turbidity	None in such concentrations that would impair any usages specifically assigned to this class.
4. Coliform bacteria per 100 ml	Not to exceed an average value of 1000 during any monthly sampling period nor 2400 in more than 20% of samples examined during such period.
5. Taste and odor	None in such concentrations that would impair any usages specifically assigned to this class and none that would cause taste and odor in edible fish.
6. pH	6.5 - 8.0
7. Allowable temperature increase	None except where the increase will not exceed the recommended limit on the most sensitive receiving water use and in no case exceed 83° F in warm water fisheries, and 68° F in cold water fisheries, or in any case raise the normal temperature of the receiving water more than 4° F.

Chemical constituents	None in concentrations or combinations which would be harmful or offensive to human, or harmful to animal or aquatic life or any water use specifically assigned to this class.
Radioactivity	None in concentrations or combinations which would be harmful to human, animal, or aquatic life for the appropriate water use. None in such concentrations which would result in radio-nuclide concentrations in aquatic life which exceed the recommended limits for consumption by humans.
Total phosphate	Not to exceed an average of 0.05 mg/l as P during any monthly sampling period.
. Ammonia	Not to exceed an average of 0.5 mg/l as N during any monthly sampling period.
. Phenols	Shall not exceed .001 mg/l at any time.

lass C - Suitable for recreational boating; habitat for wildlife and ommon food and game fishes indigenous to the region; certain industrial ooling and process uses; under some conditions acceptable for public water pply with appropriate treatment. Suitable for irrigation of crops used r consumption after cooking. **Good aesthetic value.**

Standards of Quality

tem	Water Quality Criteria
. Dissolved oxygen	Not less than 5 mg/l during at least 16 hours of any 24-hour period nor less than 3 mg/l at any time. For seasonal cold water fisheries at least 5 mg/l must be maintained.
. Sludge deposits-solid-refuse floating solids-oils-grease-scum	None allowable except those amounts that may result from the discharge from waste treatment facilities providing appropriate treatment.

3. Color and turbidity	None allowable in such concentrations that would impair any usages specifically assigned to this class.
4. Coliform bacteria	None in such concentrations that would impair any usages specifically assigned to this class.
5. Taste and odor	None in such concentrations that would impair any usages specifically assigned to this class, and none that would cause taste and odor to edible fish.
6. pH	6.0 - 8.5
7. Allowable temperature increase	None except where the increase will not exceed the recommended limits on the most sensitive receiving water use and in no case exceed 83° F in warm water fisheries, and 68° F in cold water fisheries, or in any case raise the normal temperature of the receiving water more than 4° F.
8. Chemical constituents	None in concentrations or combinations which would be harmful or offensive to human, or harmful to animal or aquatic life or any water use specifically assigned to this class.
9. Radioactivity	None in concentrations or combinations which would be harmful to human, animal, or aquatic life for the appropriate water use. None in such concentrations which would result in radio-nuclide concentrations in aquatic life which exceed the recommended limits for consumption by humans.
0. Total phosphate	Not to exceed an average of 0.05 mg/l as P during any monthly sampling period.

11. Ammonia	Not to exceed an average of 1.0 mg/l as N during any monthly sampling period.
12. Phenols	Not to exceed an average of 0.002 mg/l at any time.

Class D - Suitable for aesthetic enjoyment, power, navigation, and certain industrial cooling and process uses. Class D waters will be assigned only where a higher water use class cannot be attained after all appropriate waste treatment methods are utilized.

Item	Specifications
1. Dissolved oxygen	Not less than 2 mg/l at any time.
2. Sludge deposits - solid refuse-floating solids-oils-grease-scum	None allowable except those amounts that may result from the discharge from waste treatment facilities providing appropriate treatment.
3. Color and turbidity	None in such concentrations that would impair any usages specifically assigned to this class.
4. Coliform bacteria	None in such concentrations that would impair any usages specifically assigned to this class.
5. Taste and odor	None in such concentrations that would impair any usages specifically assigned to this class.
6. pH	6.0 - 9.0
7. Allowable temperature increase	None except where the increase will not exceed the recommended limits on the most sensitive receiving water use and in no case exceed 90° F.
8. Chemical constituents	None in concentrations or combinations which would be harmful to human, animal, or aquatic life for the designated water use.

9. Radioactivity	None in such concentrations or combinations which would be harmful to human, animal, or aquatic life for the designated water use. None in such concentrations which will result in radio-nuclide concentrations in aquatic life which exceed the recommended limits for consumption by humans.

Notes:

1. All wastes shall receive appropriate waste treatment which is defined as secondary treatment with disinfection or its industrial waste treatment equivalent except when a higher degree of treatment is required to meet the objectives of the water quality standards, all as determined by the Division of Water Pollution Control. Disinfection from October 1 to May 1 may be discontinued at the discretion of the Division of Water Pollution Control.

2. Appropriate water supply treatment is as determined by the Massachusetts Department of Public Health.

3. These water quality standards do not apply to conditions brought about by natural causes.

4. Class B, & C waters shall be substantially free of pollutants that will:

   (1) unduly affect the composition of bottom fauna

   (2) unduly affect the physical or chemical nature of the bottom

   (3) interfere with the spawning of fish or their eggs

5. The average minimum consecutive 7 day flow to be expected once in ten years shall be used in the interpretation of the standards except where noted.

6. The amount of disinfection required shall be equivalent to a free and combined chlorine residual of at least 1.0 mg/l after 15 minutes contact time during peak hourly flow or maximum rate of pumpage.

Coastal and Marine Waters

Class SA - Suitable for any high quality water use including bathing and water contact sports. Suitable for approved shellfish areas.

Standards of Quality

Item	Water Quality Criteria
1. Dissolved oxygen	Not less than 6.5 mg/l at any time.
2. Sludge deposits-solid refuse-floating solids-oil-grease-scum	None allowable
3. Color and turbidity	None in such concentrations that will impair any usages specifically assigned to this class.
4. Coliform bacteria per 100 ml	Not to exceed a median value of 70 and not more than 10% of the samples shall ordinarily exceed 230 during any monthly sampling period.
5. Taste and odor	None allowable
6. pH	6.8 - 8.5
7. Allowable temperature increase	None except where the increase will not exceed the recommended limits on the most sensitive water use.
8. Chemical constituents	None in concentrations or combinations which would be harmful to human, animal, or aquatic life or which would make the waters unsafe or unsuitable for fish or shellfish or their propagation, impair the palatability of same, or impair the waters for any other uses.

9. Radioactivity	None in concentrations or combinations which would be harmful to human, animal, or aquatic life for the designa water use. None in such concentrations which would result in radio-nuclide concentrations in aquatic li which exceed the recommended limits for consumption by humans.
10. Total phosphate	Not to exceed an average of 0.07 mg/l as P during any monthly sampling period.
11. Ammonia	Not to exceed an average of 0.2 mg/l as N during any monthly sampling period.

Class SB - Suitable for bathing and recreational purposes including water contact sports; industrial cooling; excellent fish habitat; good aesthetic value; and suitable for certain shellfisheries with depuration. (Restricted Shellfish Areas).

Standards of Quality

Item	Water Quality Criteria
1. Dissolved oxygen	Not less than 5.0 mg/l at an time.
2. Sludge deposits-solid refuse-floating solids-oils-grease-scum	None allowable
3. Color and turbidity	None in such concentrations that would impair any usages specifically assigned to this class.
4. Coliform bacteria per 100 ml	Not to exceed a median value of 700 and not more than 230 in more than 10% of the sampl during any monthly sampling period.
5. Taste and odor	None in such concentrations that would impair any usages specifically assigned to this class and none that would cause taste and odor in edibl fish or shellfish.
6. pH	6.8 - 8.5

7. Allowable temperature increase	None except where the increase will not exceed the recommended limits on the most sensitive water use.
8. Chemical constituents	None in concentrations or combinations which would be harmful to human, animal or aquatic life or which would make the waters unsafe or unsuitable for fish or shellfish or their propagation, impair the palatability of same, or impair the water for any other usage.
9. Radioactivity	None in concentrations or combinations which would be harmful to human, animal, or aquatic life for the appropriate water use. None in such concentrations which would result in radio-nuclide concentrations in aquatic life which exceed the recommended limits for consumption by humans.
10 Total phosphate	Not to exceed an average of 0.07 mg/l as P during any monthly sampling period.
11. Ammonia	Not to exceed an average of 0.2 mg/l as N during any monthly sampling period.

Class SC - Suitable for aesthetic enjoyment; for recreational boating; habitat for wildlife and common food and game fishes indigenous to the region; industrial cooling and process uses.

Standards of Quality

Item	Water Quality Criteria
1. Dissolved oxygen	Not less than 5 mg/l during at least 16 hours of any 24-hour period nor less than 3 mg/l at any time.

2. Sludge deposits-solid refuse-floating solids-oils-grease-scum	None except that amount that may result from the discharge from a waste treatment facility providing appropriate treatment.
3. Color and turbidity	None in such concentrations that would impair any usages specifically assigned to this class.
4. Coliform bacteria	None in such concentrations that would impair any usages specifically assigned to this class.
5. Taste and odor	None in such concentrations that would impair any usages specifically assigned to this class and none that would cause taste and odor in edible fish or shellfish.
6. pH	6.5 - 8.5
7. Allowable temperature increase	None except where the increase will not exceed the recommended limits on the most sensitive water use.
8. Chemical constituents	None in concentrations or combinations which would be harmful to human, animal or aquatic life or which would make the waters unsafe or unsuitable for fish or shellfi or their propagation, impair the palatability of same, or impair the water for any other usage.
9. Radioactivity	None in such concentrations which would be harmful to human, animal or aquatic life for the designated water use. None in such concentrati which would result in radionuclide concentrations in aquatic life which exceed the recommended limits for consumption by humans.

10. Total phosphate	**Not to exceed an average of 0.07 mg/l as P during any monthly sampling period.**
11. Ammonia	**Not to exceed an average of 1.0 mg/l as N during any monthly sampling period.**

Notes:

1. Coastal and marine waters are those subject to the rise and fall of the tide.
2. Appropriate treatment is defined as the degree of treatment with disinfection required for the receiving waters to meet their assigned state or interstate classification and to meet the objectives of the water quality standards. Disinfection from October 1 to May 1 may be discontinued at the discretion of the Division of Water Pollution Control.
3. The water quality standards do not apply to conditions brought about by natural causes.
4. The waters shall be substantially free of pollutants that will:
    - (1) unduly affect the composition of bottom fauna
    - (2) unduly affect the physical or chemical nature of the bottom
    - (3) interfere with the spawning of fish or their eggs
5. The standards shall apply at all times in coastal and marine waters
6. The amount of disinfection required shall be equivalent to a free and combined chlorine residual of at least 1.0 mg/l after 15 minutes contact time during peak hourly flow or maximum rate of pumpage.

Approved by Commissioner of Public Health

Date: /3/67

Alfred L. Frechette

Dr. Alfred L. Frechette

Approved by Division of Water Pollution Control

Date: 3/3/67

Thomas C. McMahon

Thomas C. McMahon
Director

A TRUE COPY ATTEST:

Rose Stern
Notary Public

APPENDIX B

STATE OF RHODE ISLAND
AND
PROVIDENCE PLANTATIONS

DEPARTMENT OF HEALTH
DIVISION OF WATER POLLUTION CONTROL

STANDARDS OF QUALITY FOR CLASSIFICATION OF WATERS OF THE STATE

GENERAL POLICY

The following are the standards of water quality adopted for use in the classification of the waters of the state. In classification of the waters, consideration is given to all factors involved, including public health, public enjoyment, propagation and protection of fish and wildlife, and economic and social development. Classifications are not intended to permit indiscriminate waste disposal or to allow minimum efforts of waste treatment under any circumstances.

In the discharge of waste treatment plant effluents to the receiving waters, cognizance shall be given both in time and distance to allow for mixing of effluent and stream. Such distances required for complete mixing shall not affect the water usage Class adopted, but shall be defined and controlled by the regulatory authority.

1. Antidegradation Policy

Rhode Island has adopted the following antidegradation policy:

> "Waters whose existing quality is better than the established standards as of the date on which such standards become effective will be maintained at such high quality unless it has been affirmatively demonstrated to the State that a change is justifiable as a result of necessary economic or social development and will not result in a significant loss of a use presently possible in such waters. Any industrial, public, or private project or development which would constitute a new source of pollution or an increased source of pollution to high quality waters will be required to provide the highest and best practicable means of waste treatment to maintain high water quality. In implementing this policy, the Secretary of the Interior will be kept advised and will be provided with such information as he will need to discharge his responsibilities under the Federal Water Pollution Control Act, as amended, on August 31, 1970."

WATER QUALITY STANDARDS

In accordance with Title 46, Chapter 12 of the General Laws of 1956, the interstate inland and sea waters and intrastate waters have been classified according to the water quality standards adopted by the Rhode Island Department of Health. These standards are comparable to those revised and adopted on April 18, 1967 by the New England Interstate Water Pollution Control Commission. The standards are in two parts providing for the classification of fresh and sea waters. Sea waters or tidal waters are defined as those waters subject to the rise and fall of the tide. When definite additional parameters for the various water uses are developed, they will be included in the standards. Bio-assays will continue to be used to determine the limits for substances discharged into waters used for the propagation of fish if established limits are not available.

FRESH WATER

CLASS A Suitable for water supply and all other water uses; character uniformly excellent. (See Note 11)

Standards of Water Quality

	Item	Water Quality Criteria
1.	Dissolved oxygen	75% saturation, 16 hours/day 5 mg/l at any time
2.	Sludge deposits--solid refuse --floating solids, oils, and grease--scum	None allowable
3.	Color and turbidity	None other than of natural origin
4.	Coliform bacteria per 100 ml	Not to exceed a median of 100 per 100 ml nor more than 500 in more than 10% of samples collected
5.	Taste and odor	None other than of natural origin
6.	pH	As naturally occurs
7.	Allowable temperature increase	None other than of natural origin
8.	Chemical constituents	(See Note 5)

CLASS B Suitable for bathing, other recreational purposes, agricultural uses, industrial processes and cooling; excellent fish and wildlife habitat; good aesthetic value; acceptable for public water supply with appropriate treatment.

Standards of Water Quality

	Item	Water Quality Criteria
1.	Dissolved oxygen	75% saturation, 16 hours/day 5 mg/l at any time
2.	Sludge deposits--solid refuse --floating solids, oils, and grease--scum	None allowable
3.	Color and turbidity	None in such concentrations that would impair any usages specifically assigned to this Class
4.	Coliform bacteria per 100 ml	Not to exceed a median of 1,000 per 100 ml nor more than 2,400 in more than 20% of samples collected
5.	Taste and odor	None in such concentrations that would impair any usages specifically assigned to this Class nor cause taste and odor in edible fish
6.	pH	6.5 - 8.0
7.	Allowable temperature increase	Only such increases that will not impair any usages specifically assigned to this Class (See Note 7)
8.	Chemical constituents	(See Note 5)

CLASS C Suitable for fish and wildlife habitat; recreational boating, and industrial processes and cooling; under some conditions acceptable for public water supply with appropriate treatment; good aesthetic value.

Standards of Water Quality

Item	Water Quality Criteria
1. Dissolved oxygen	Minimum 5 mg/l any time. Normal seasonal and diurnal variations above 5 mg/l will be maintained. For sluggish eutrophic waters, not less than 4 mg/l at any time. Normal seasonal and diurnal variations above 4 mg/l will be maintained.
2. Sludge deposits--solid refuse --floating solids, oils and grease--scum	None (See Note 8)
3. Color and turbidity	None in such concentrations that would impair any usages specifically assigned to this Class
4. Coliform bacteria per 100 ml	None in such concentrations that would impair any usages specifically assigned to this Class
5. Taste and odor	None in such concentrations that would impair any usages specifically assigned to this Class nor cause taste and odor in edible fish
6. pH	6.0 - 8.5
7. Allowable temperature increase	Only such increases that will not impair any usages specifically assigned to this Class (See Note 7)
8. Chemical constituents	(See Note 5)

CLASS D Suitable for navigation, power, certain industrial processes and cooling, and migration of fish; good aesthetic value.

Standards of Water Quality

	Item	Water Quality Criteria
1.	Dissolved oxygen	A minimum of 2 mg/l at any time
2.	Sludge deposits--solid refuse --floating solids, oils and grease--scum	None (See Note 8)
3.	Color and turbidity	None in such concentrations that would impair any usages specifically assigned to this Class
4.	Coliform bacteria per 100 ml	None in such concentrations that would impair any usages specifically assigned to this Class
5.	Taste and odor	None in such concentrations that would impair any usages specifically assigned to this Class
6.	pH	6.0 - 9.0
7.	Allowable temperature increase	None except where the increase will not exceed the recommended limits on the most sensitive water use and in no case exceed 90°F
8.	Chemical constituents	(See Note 5)

NOTES:

1. These Standards do not apply to conditions brought about by natural causes.

2. Class D waters will be assigned only where a higher water use Class cannot be attained after all appropriate waste treatment methods are utilized. Appropriate waste treatment shall be secondary treatment with disinfection or the equivalent. Lesser degrees of treatment will be permitted only where it can be demonstrated that attainment of the specified water use class standard of quality can be effectuated.

3. All sewage treatment plant effluents shall receive disinfection before discharge into a watercourse.

4. Any water falling below the standards of quality for a given Class shall be considered unsatisfactory for the uses indicated for that Class. Waters falling below the standards of quality for Class D shall be Class E and considered to be in a nuisance condition.

5. Waters shall be free from chemical constituents and radioactive materials in concentrations or combinations which would be harmful to human, animal, or aquatic life for the appropriate, most sensitive and governing water class use. In areas where fisheries are the governing considerations and approved limits have not been established, bio-assays shall be performed as required by the appropriate agencies. For public drinking water supplies the limits prescribed by the United States Public Health Service will be used where not superseded by more stringent signatory State requirements.

6. Deleted

7. The temperature increase shall not raise the temperature of the receiving waters above 68°F for waters supporting cold water fisheries and 83°F for waters supporting a warm water fishery. In no case shall the temperature of the receiving water be raised more than 4°F.

8. Sludge deposits, floating solids, oils, grease and scum shall not be allowed, except for such small amounts that may result from the discharge of appropriately treated sewage or industrial waste effluents.

9. The minimum average daily flow for seven consecutive days that can be expected to occur once in ten years shall be the minimum flow to which the standards apply.

10. Class B and C waters shall be substantially free of pollutants that:
    a) Unduly affect the composition of bottom fauna,
    b) Unduly affect the physical or chemical nature of the bottom,
    c) Interfere with the propagation of fish.

11. Class A waters in use for drinking water supply may be subject to restricted use by State and local authorities.

SEA WATER

CLASS SA: Suitable for all sea water uses including shellfish harvesting for direct human consumption (approved shellfish areas), bathing, and other water contact sports.

Standards of Quality

	Item	Water Quality Criteria
1.	Dissolved oxygen	Not less than 6.0 mg/l at any time
2.	Sludge deposits--solid refuse --floating solids--oil--grease--scum	None allowable
3.	Color and turbidity	None in such concentrations that will impair any usages specifically assigned to this Class
4.	Coliform bacteria per 100 ml	Not to exceed a median MPN of 70 and not more than 10% of the samples shall ordinarily exceed an MPN of 230 for a 5-tube decimal dilution or 330 for a 3-tube decimal dilution (See Note S.6)
5.	Odor	None allowable
6.	pH	6.8 - 8.5
7.	Allowable temperature increase	None except where the increase will not exceed the recommended limits for the most sensitive water use
8.	Chemical constituents	None in concentrations or combinations which would be harmful to human, animal, or aquatic life or which would make the waters unsafe or unsuitable for fish or shellfish or their propagation, impair the palatability of same, or impair the waters for any other uses
9.	Radioactivity	(See Note S.8)

CLASS SB: Suitable for bathing, other recreational purposes, industrial cooling and shellfish harvesting for human consumption after depuration (restricted shellfish area); excellent fish and wildlife habitat; good aesthetic value.

Standards of Quality

Item	Water Quality Criteria
1. Dissolved oxygen	Not less than 5.0 mg/l at any time
2. Sludge deposits--solid refuse --floating solids--oils-- grease--scum	None allowable
3. Color and turbidity	None in such concentrations that would impair any usages specifically assigned to this class
4. Coliform bacteria per 100 ml	Not to exceed a median value of 700 and not more than 2,3000 in more than 10% of the samples (See Note S6)
5. Taste and odor	None in such concentrations that would impair any usages specifically assigned to this class and none that would cause taste and odor in edible fish or shellfish
6. pH	6.8 - 8.5
7. Allowable temperature increase	None except where the increase will not exceed the recommended limits on the most sensitive water use assigned to this class
8. Chemical constituents	None in concentrations or combinations which would be harmful to human, animal or aquatic life or which would make the waters unsafe or unsuitable for fish or shellfish or their propagation, or impair the water for any other usage assigned to this class
9. Radioactivity	(See Note S8)

CLASS SC: Suitable for fish, shellfish and wildlife habitat; suitable for recreational boating, and industrial cooling; good aesthetic value.

Standards of Quality

	Item	Water Quality Criteria
1.	Dissolved oxygen	Not less than 5 mg/l during at least 16 hours of any 24-hour period, nor less than 4 mg/l at any time
2.	Sludge deposits--solid refuse --floating solids--oils-- grease--scum	None except that amount that may result result from the discharge from a waste treatment facility providing appropriate treatment
3.	Color and turbidity	None in such concentrations that would impair any usages specifically assigned to this class
4.	Coliform bacteria	None in such concentrations that would impair any usages specifically assigned to this class
5.	Taste and odor	None in such concentrations that would impair any usages specifically assigned to this class and none that would cause taste and odor in edible fish or shellfish
6.	pH	6.5 - 8.5
7.	Allowable temperature increase	None except where the increase will not exceed the recommended limits on the most sensitive water use assigned to this class
8.	Chemical constituents	None in concentrations or combinations which would be harmful to human, animal or aquatic life or which would make the waters unsafe or unsuitable for fish or shellfish or their propagation, or impair the water for any other usage assigned to this class
9.	Radioactivity	(See Note S.8)

CLASS SD: Suitable for navigation, industrial cooling and migration of fish; good aesthetic value

Standards of Quality

Item	Water Quality Criteria
1. Dissolved oxygen	Not less than 2 mg/l at any time
2. Sludge deposits--solid refuse --floating solids--oils grease--scum	None except that amount that may result from the discharge from a waste treatment facility providing appropriate treatment
3. Color and turbidity	None in such concentrations that would impair any usages specifically assigned to this class
4. Coliform bacteria	None in such concentrations that would impair any usages specifically assigned to this class
5. Taste and odor	None in such concentrations that would impair any usages specifically assigned to this class and none that would cause taste and odor in edible fish or shellfish
6. pH	6.5 - 8.5
7. Allowable temperature increase	None except where the increase will not exceed the recommended limits on the most sensitive water use
8. Chemical constituents	None in concentrations or combinations which would be harmful to human, animal or aquatic life or which would make the waters unsafe or unsuitable for fish or shellfish or their propagation, impair the palatability of same, or impair the water for any other usage
9. Radioactivity	(See Note S.8)

NOTES:

S.1 Sea waters are those waters subject to the rise and fall of the tide.

S.2 Class SD waters will be assigned only where a higher water use Class cannot be attained after appropriate waste treatment methods are utilized. Appropriate waste treatment shall be secondary treatment with disinfection or the equivalent. Lesser degrees of treatment will be permitted only where it can be demonstrated that attainment of the specified water use class standard of quality can be effectuated.

S.3 All sewage treatment plant effluents shall receive disinfection before discharge to sea waters.

S.4 The water quality standards do not apply to conditions brought about by natural causes.

S.5 The waters shall be substantially free of pollutants that will:
  a) Unduly affect the composition of bottom fauna,
  b) Unduly affect the physical or chemical nature of the bottom,
  c) Interfere with the propagation of fish.

S.6 Bacteriological surveys of sea waters should include sampling during periods when the most unfavorable hydrographic and pollution conditions prevail.

S.7 Any water falling below the standards of quality for a given Class shall be considered unsuitable for the uses indicated for that Class. Waters falling below the standards of quality for Class SD shall be Class SE and considered to be in a nuisance condition.

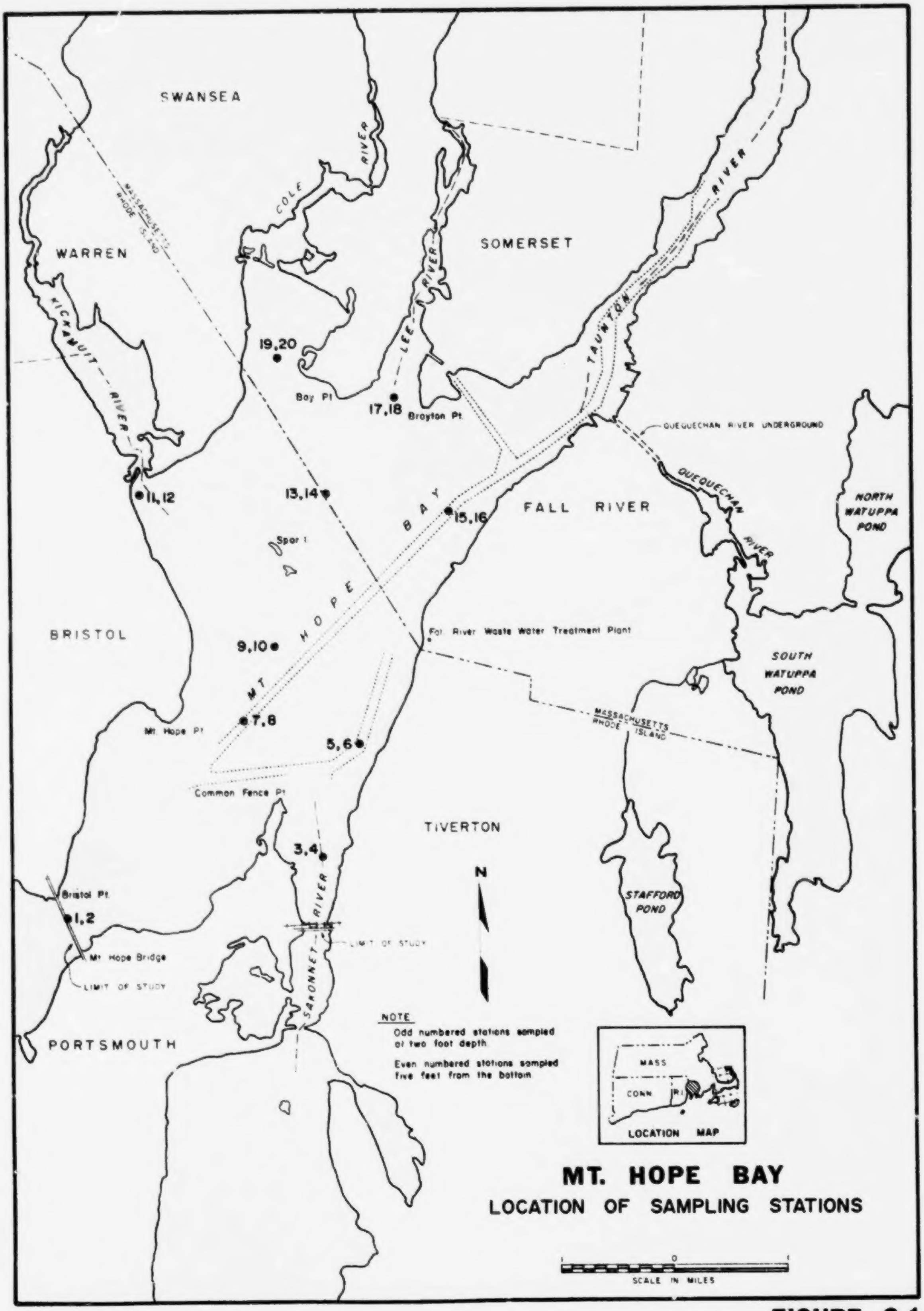
S.8 The level of radioactive materials in all waters shall not be in concentrations or combinations which would be harmful to human, animal or aquatic life.

APPENDIX C

DATA SUMMARY

MT. HOPE BAY STUDY

August 3-7, 1970


SWANSEA
COLE RIVER
WARREN
MASSACHUSETTS
RHODE ISLAND
SOMERSET
LEE RIVER
TAUNTON RIVER
KICKAMUIT RIVER
19,20
Bay Pt
17,18
Brayton Pt.
QUEQUECHAN RIVER UNDERGROUND
QUEQUECHAN RIVER
NORTH WATUPPA POND
11,12
13,14
15,16
FALL RIVER
Spar I
MT HOPE BAY
BRISTOL
9,10
Fall River Waste Water Treatment Plant
SOUTH WATUPPA POND
7,8
Mt. Hope Pt
5,6
MASSACHUSETTS
RHODE ISLAND
Common Fence Pt
TIVERTON
3,4
N
Bristol Pt.
1,2
STAFFORD POND
SAKONNET RIVER
LIMIT OF STUDY
Mt Hope Bridge
LIMIT OF STUDY
PORTSMOUTH
NOTE
Odd numbered stations sampled at two foot depth.
Even numbered stations sampled five feet from the bottom.
MASS
CONN
RI
LOCATION MAP
0
1
SCALE IN MILES

MT. HOPE BAY
LOCATION OF SAMPLING STATIONS

FIGURE C-1

MOUNT HOPE BAY
SUMMARY OF FIELD DATA BY TIDES
AUGUST 3-7, 1970

Station #		Temperature °C		Conductivity millimhos		Salinity g/l		DO mg/l		Total Coliforms per 100 ml		Fecal Coliforms per 100 ml	
		High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
1	Max.	24.5	26.6	45.38	45.64	30.3	30.0	9.7	8.3	49	240	20	78
	Min.	23.0	24.1	43.46	44.32	27.3	28.8	6.0	5.6	14	8	2	2
	Ave.	23.7	25.0	44.34	44.94	29.3	29.2	8.1	7.5	24	94	11	30
2	Max.	22.3	22.3	43.50	43.30	31.6	31.8	8.8	7.2	130	33	22	20
	Min.	18.4	19.0	41.46	41.72	29.6	30.1	6.3	5.4	4	2	2	2
	Ave.	19.4	20.1	42.16	42.61	30.6	30.7	7.0	6.2	41	16	13	11
3	Max.	26.0	26.3	45.80	45.45	29.8	30.0	9.5	8.9	5400	4900	3500	1100
	Min.	24.0	20.4	43.78	39.48	28.4	28.7	5.1	7.3	310	20	40	20
	Ave.	25.1	24.4	44.67	44.22	28.9	29.3	7.6	8.1	2758	1281	913	299
4													
	Max.	25.2	23.8	45.65	45.00	30.5	30.3	6.3	6.6	2400	490	230	490
	Min.	21.5	18.6	43.09	27.58	29.0	29.4	4.9	5.0	45	13	5	2
	Ave.	23.6	22.3	44.35	42.16	29.6	29.9	5.7	6.0	514	165	83	77
5													
	Max.	26.2	26.6	45.18	45.00	30.0	29.8	8.6	8.0	16,000	240,000	3500	79,000
	Min.	23.8	21.5	42.22	38.30	28.5	28.2	6.3	4.9	79	1300	17	280
	Ave.	25.0	24.7	44.29	43.78	29.0	28.9	7.9	6.6	4214	52,100	1150	18,644
6													
	Max.	24.1	24.0	44.70	44.92	30.5	30.7	5.5	5.9	790	790	70	78
	Min.	20.9	18.5	42.60	38.88	29.2	29.3	4.5	4.9	20	79	11	8
	Ave	22.9	22.2	44.04	43.42	29.8	29.9	5.2	5.3	205	289	30	32

MOUNT HOPE BAY
SUMMARY OF FIELD DATA BY TIDES
AUGUST 3-7, 1970

Station #	Temperature °C		Conductivity millimhos		Salinity g/l		DO mg/l		Total Coliforms per 100 ml		Fecal Coliforms per 100 ml	
	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
7												
Max.	26.2	27.0	45.62	45.52	29.5	29.7	9.2	8.6	3500	3500	230	1100
Min.	24.4	21.6	44.04	42.88	28.3	28.3	6.4	6.7	13	17	2	11
Ave.	25.2	25.2	44.86	44.67	29.0	28.9	8.1	7.8	522	1151	50	243
8												
Max.	23.1	23.8	44.12	44.20	31.2	31.1	5.9	5.9	78	20	45	20
Min.	19.5	20.0	42.06	41.94	29.7	29.3	5.2	4.5	2	2	2	2
Ave.	21.1	21.5	43.17	43.14	30.4	30.3	5.6	5.3	19	17	13	11
9												
Max.	27.0	27.6	45.84	46.00	29.6	29.5	9.1	8.8	2400	5400	330	3500
Min.	24.4	24.5	43.80	44.42	28.4	28.4	6.5	5.8	13	78	5	7
Ave.	25.5	25.8	44.72	45.09	28.8	28.9	8.1	7.1	646	1230	119	554
10												
Max.	26.2	26.8	45.82	45.98	29.5	29.6	7.9	7.0	330	2400	20	330
Min.	24.0	23.7	43.80	44.30	28.1	28.5	6.5	5.5	9	2	2	2
Ave.	24.9	25.4	44.62	44.98	29.0	29.0	7.1	6.3	91	538	14	139
11												
Max.	26.9	27.0	46.08	45.70	29.6	29.4	9.1	7.8	790	240	330	45
Min.	25.5	23.3	44.38	44.64	28.0	28.4	6.4	5.8	2	2	2	2
Ave.	26.1	25.5	45.18	45.11	28.7	28.9	7.8	6.5	189	75	64	14
12												
Max.	26.3	27.0	44.50	45.82	29.6	29.4	9.0	7.3	490	45	130	20
Min.	25.0	24.8	44.16	44.60	28.3	28.3	6.4	5.7	4	5	2	2
Ave.	25.7	25.9	44.78	45.09	28.7	28.8	7.9	6.3	149	16	44	9

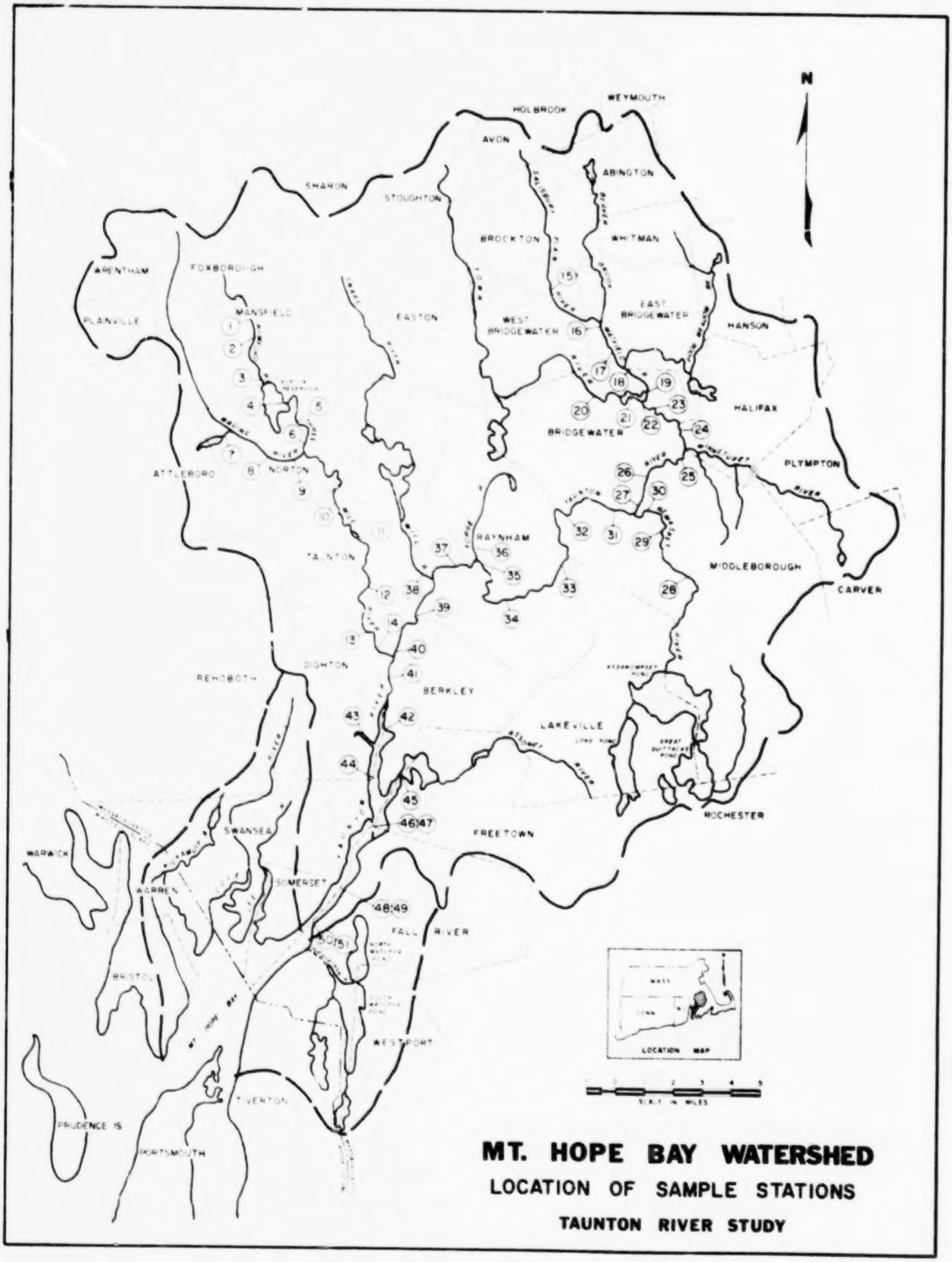
MOUNT HOPE BAY
SUMMARY OF FIELD DATA BY TIDES
AUGUST 3-7, 1970

Station #	Temperature °C		Conductivity millimhos		Salinity g/l		DO mg/l		Total Coliforms per 100 ml		Fecal Coliforms per 100 ml	
	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
13												
Max.	27.3	28.0	45.60	46.55	29.6	29.4	7.6	7.5	5400	1300	490	170
Min.	25.6	23.7	42.12	43.10	27.9	28.6	5.8	5.9	4	43	2	7
Ave.	25.9	2[illegible].2	44.55	45.24	28.7	28.9	7.1	6.6	925	507	138	76
14												
Max.	26.9	26.8	45.26	46.60	29.5	29.4	6.9	6.7	700	490	230	240
Min.	23.4	23.7	43.70	43.20	28.5	28.7	5.3	4.5	20	23	11	11
Ave.	25.0	25.1	44.60	44.67	29.0	28.9	5.9	5.6	217	231	56	69
15												
Max.	26.9	26.4	44.92	44.70	29.7	29.4	7.5	7.4	16,000	13,000	7000	3500
Min.	23.7	22.9	44.04	43.37	25.5	27.8	5.0	4.6	170	110	22	13
Ave.	25.4	24.8	44.40	43.83	28.3	28.6	6.7	5.9	7187	4482	1968	1289
16												
Max.	25.6	26.0	45.32	44.62	30.9	31.4	5.5	5.3	3500	1300	350	78
Min.	20.2	20.2	42.32	42.34	28.6	28.3	4.0	4.6	33	5	2	2
Ave.	23.1	21.8	44.12	43.61	29.6	30.0	4.9	5.1	510	242	58	30
17												
Max.	30.1	32.2	49.78	48.08	29.7	30.1	6.8	6.8	1700	1700	1300	770
Min.	27.0	26.1	45.92	46.60	28.4	28.8	5.1	4.6	5	33	5	7
Ave.	28.3	28.5	47.33	47.35	28.9	29.3	6.1	5.7	395	559	214	181
18												
Max.	26.9	28.4	46.35	47.70	31.0	29.8	7.1	6.0	790	790	330	490
Min.	23.8	23.9	43.54	43.94	28.4	28.3	5.0	5.1	31	78	5	20
Ave.	25.1	26.0	44.77	45.57	29.2	29.0	5.8	5.7	222	531	79	190

MOUNT HOPE BAY
SUMMARY OF FIELD DATA BY TIDES
AUGUST 3-7, 1970

Station #	Temperature ^{o}C		Conductivity millimhos		Salinity g/l		DO mg/l		Total Coliforms per 100 ml		Fecal Coliforms per 100 ml	
	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
19												
Max.	28.0	27.7	45.96	45.94	29.4	29.6	9.0	7.8	330	330	79	45
Min.	25.2	24.8	44.70	44.60	28.2	28.4	6.0	5.7	2	2	2	2
Ave.	26.6	26.2	45.51	45.53	28.7	28.9	7.7	6.5	117	107	25	18
20												
Max.	27.6	27.2	45.85	46.00	29.5	29.7	7.3	7.1	330	330	49	245
Min.	24.2	24.4	43.92	44.40	28.0	28.5	5.3	4.1	2	13	2	2
Ave.	25.8	25.9	45.11	45.21	28.7	29.0	6.3	5.8	76	112	19	44

APPENDIX D


N
HOLBROOK
WEYMOUTH
AVON
ABINGTON
SHARON
STOUGHTON
BROCKTON
WHITMAN
WRENTHAM
FOXBOROUGH
MANSFIELD
PLAINVILLE
EASTON
WEST BRIDGEWATER
EAST BRIDGEWATER
HANSON
HALIFAX
BRIDGEWATER
PLYMPTON
ATTLEBORO
NORTON
TAUNTON
RAYNHAM
MIDDLEBOROUGH
CARVER
REHOBOTH
DIGHTON
BERKLEY
LAKEVILLE
SWANSEA
FREETOWN
ROCHESTER
WARWICK
WARREN
SOMERSET
FALL RIVER
BRISTOL
MT. HOPE BAY
WESTPORT
TIVERTON
PRUDENCE IS
PORTSMOUTH
TAUNTON RIVER
WINNETUXET RIVER
ASSONET RIVER
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MASS
CONN
LOCATION MAP
0 1 2 3 4 5
SCALE IN MILES

MT. HOPE BAY WATERSHED

LOCATION OF SAMPLE STATIONS

TAUNTON RIVER STUDY

FIGURE D-1

DATA SUMMARY

TAUNTON RIVER STUDY

July 24 - August 7, 1970

```
STORET RETRIEVAL DATE 71/11/11
                                                                  TR01
                                                                  42 02 06.0 071 13 34.0
                                                                  TAUNTON RIVER BASIN
                                                                  00 MASSACHUSETTS
                                                                  NORTHEAST (01)
                                                                  NARRAGANSET BAY (06) MOUNT HOPE BAY
                                                                  1111REG1            2111204
                                                                  2                   0000 FEET  DEPTH

                         00010      00300      00310      31501      31616
  DATE    TIME DEPTH    WATER        DO        BOD      TOT COLI   FEC COLI
  FROM     OF           TEMP                  5 DAY     MFIMENDO   MFM-FCBR
   TO     DAY   FEET    CENT        MG/L       MG/L      /100ML     /100ML

00/00/00
STATION  MAXIMUM          21.5        6.6        2.0      31000        900
         MINIMUM          18.5        3.4        1.0       6200        230
         MEAN             20.1        5.9        1.1      13600        414
99/99/99

                         00403      00080      00070      00500      00505      00530      00535      00410
  DATE    TIME DEPTH      LAB       COLOR       TURB     RESIDUE    RESIDUE    RESIDUE    RESIDUE     T ALK
  FROM     OF              PH       PT-CO       JKSN      TOTAL     TOT VOL    TOT NFLT   VOL NFLT    CACO3
   TO     DAY   FEET       SU       UNITS        JU        MG/L       MG/L       MG/L       MG/L       MG/L

00/00/00
STATION  MAXIMUM           6.8         50        2.1        302        104         15         13         16
         MINIMUM           6.1         45        1.2        144         50          3          3          8
         MEAN              6.4         47        1.6        210         74         10          8         12
99/99/99

                         60050      32230      00665      00625      00610      00615      00630
  DATE    TIME DEPTH    ALGAE     CHLRPHYL    PHOS-T    TOT KJEL   AMMONIA    NITRITE    NO2&NO3
  FROM     OF           TOTAL         A       P-WET         N        NH3-N      NO2-N         N
   TO     DAY   FEET     /ML        MG/L       MG/L       MG/L       MG/L       MG/L       MG/L

00/00/00
STATION  MAXIMUM          3962        2.7       0.92       3.00       0.36                  1.76
         MINIMUM          3962        1.0       0.20       0.10       0.07                  0.56
         MEAN             3962        1.8       0.55       1.02       0.18                  1.25
99/99/99
```

```
STORET RETRIEVAL DATE 71/11/11
                                                                       TR02
                                                                      42 01 27.0 071 13 12.0
                                                                      TAUNTON RIVER BASIN
                                                                      00 MASSACHUSETTS
                                                                      NORTHEAST 801<
                                                                      NARRAGANSET BAY806<  MOUNT HOPE BAY
                                                                      1111REG1               2111204
                                                                      2                     0000 FEET  DEPTH

                          00010      00300      00310      31501      31616
 DATE      TIME DEPTH    WATER        DO         BOD      TOT COLI   FEC COLI
 FROM       OF           TEMP                   5 DAY     MFIMENDO   MFM-FCBR
  TO       DAY   FEET    CENT        MG/L       MG/L      /100ML     /100ML

00/00/00
STATION   MAXIMUM         22.5        8.4        3.0      93000        350
          MINIMUM         19.5        6.7        1.0      24000         70
          MEAN            21.3        7.4        1.9      53600        145
99/99/99


                          00403      00080      00070      00500      00505      00530      00535      00410
 DATE      TIME DEPTH     LAB        COLOR      TURB      RESIDUE    RESIDUE    RESIDUE    RESIDUE     T ALK
 FROM       OF            PH         PT-CO      JKSN       TOTAL     TOT VOL    TOT NFLT   VOL NFLT    CACO3
  TO       DAY   FEET     SU         UNITS       JU        MG/L       MG/L       MG/L       MG/L        MG/L

00/00/00
STATION   MAXIMUM          6.7         65        2.7        195        102          9          9          16
          MINIMUM          6.5         55        1.5        139         48          1          1          14
          MEAN             6.6         58        2.1        164         63          5          5          15
99/99/99


                          60050      32230      00665      00625      00610      00615      00630
 DATE      TIME DEPTH    ALGAE      CHLRPHYL    PHOS-T    TOT KJEL   AMMONIA    NITRITE    NO2&NO3
 FROM       OF           TOTAL        A         P-WET        N        NH3-N      NO2-N        N
  TO       DAY   FEET     /ML        MG/L        MG/L       MG/L       MG/L       MG/L       MG/L

00/00/00
STATION   MAXIMUM         5660        2.6       0.44       1.50       0.44                  0.92
          MINIMUM         5660        1.6       0.12       0.10       0.06                  0.44
          MEAN            5660        2.2       0.30       0.82       0.20                  0.76
99/99/99
```

```
STORET RETRIEVAL DATE 71/11/11
                                                                                     TR03
                                                                                    41 59 45.0 071 12 40.0
                                                                                    TAUNTON RIVER BASIN
                                                                                    00 MASSACHUSETTS
                                                                                    NORTHEAST *01<
                                                                                    NARRAGANSET BAY*06<  MOUNT HOPE BAY
                                                                                    1111REG1               2111204
                                                                                    2                      0000 FEET  DEPTH

                           00010      00300      00310      31501      31616
  DATE     TIME DEPTH     WATER        DO        BOD      TOT COLI   FEC COLI
  FROM      OF            TEMP                  5 DAY     MFIMENDO   MFM-FCBR
   TO      DAY   FEET     CENT        MG/L       MG/L      /100ML     /100ML

00/00/00
STATION   MAXIMUM          21.5        7.5        3.0      34000        890
          MINIMUM          18.0        6.7        0.0       5600         30
          MEAN             19.9        7.1        1.2      14380        270
99/99/99

                           00403      00080      00070      00500      00505      00530      00535      00410
  DATE     TIME DEPTH      LAB        COLOR      TURB      RESIDUE    RESIDUE    RESIDUE    RESIDUE     T ALK
  FROM      OF              PH        PT-CO      JKSN       TOTAL     TOT VOL    TOT NFLT   VOL NFLT    CACO3
   TO      DAY   FEET       SU        UNITS       JU        MG/L       MG/L       MG/L       MG/L        MG/L

00/00/00
STATION   MAXIMUM           6.7         35        2.7        210        102         21         11          12
          MINIMUM           6.3         30        1.5        150         44          1          1          10
          MEAN              6.5         32        2.2        171         63         10          7          12
99/99/99

                           60050      32230      00665      00625      00610      00615      00630
  DATE     TIME DEPTH     ALGAE      CHLRPHYL    PHOS-T    TOT KJEL   AMMONIA    NITRITE    NO2&NO3
  FROM      OF            TOTAL         A        P-WET        N        NH3-N      NO2-N        N
   TO      DAY   FEET      /ML         MG/L       MG/L       MG/L       MG/L       MG/L       MG/L

00/00/00
STATION   MAXIMUM          4641        2.0       0.68       1.50       0.40                  1.84
          MINIMUM          4641        0.9       0.08       0.20       0.06                  0.60
          MEAN             4641        1.4       0.34       0.60       0.19                  1.18
99/99/99
```

```
STORET RETRIEVAL DATE 71/11/11
                                                                                     TR04
                                                                                    41 59 10.0 071 11 20.0
                                                                                    TAUNTON RIVER BASIN
                                                                                    00 MASSACHUSETTS
                                                                                    NORTHEAST *01<
                                                                                    NARRAGANSET BAY*06<  MOUNT HOPE BAY
                                                                                    1111REG1              2111204
                                                                                    2                    0000 FEET  DEPTH

                            00010      00300      00310      31501      31616
  DATE    TIME DEPTH       WATER        DO        BOD      TOT COLI   FEC COLI
  FROM     OF              TEMP                  5 DAY     MFIMENDO   MFM-FCBR
   TO     DAY   FEET       CENT       MG/L       MG/L      /100ML     /100ML

00/00/00
STATION  MAXIMUM           24.0        9.5        8.0     100000         20
         MINIMUM           21.5        6.6        3.0       5200          4
         MEAN              22.9        7.8        4.6      24880         10
99/99/99


                            00403      00080      00070      00500      00505      00530      00535      00410
  DATE    TIME DEPTH       LAB        COLOR      TURB      RESIDUE    RESIDUE    RESIDUE    RESIDUE     T ALK
  FROM     OF               PH        PT-CO      JKSN       TOTAL     TOT VOL    TOT NFLT   VOL NFLT    CACO3
   TO     DAY   FEET        SU        UNITS       JU        MG/L       MG/L       MG/L       MG/L       MG/L

00/00/00
STATION  MAXIMUM            7.0         45       16.0        178         86         26         22         16
         MINIMUM            5.6         27        3.5        139         50         20         18         11
         MEAN               6.8         35        9.0        158         67         23         20         13
99/99/99


                            60050      32230      00665      00625      00610      00615      00630
  DATE    TIME DEPTH       ALGAE     CHLRPHYL    PHOS-T    TOT KJEL   AMMONIA    NITRITE    NO2&NO3
  FROM     OF              TOTAL        A        P-WET        N       NH3-N      NO2-N        N
   TO     DAY   FEET        /ML       MG/L       MG/L       MG/L       MG/L       MG/L       MG/L

00/00/00
STATION  MAXIMUM          55468       16.5       2.40       1.70       0.32                  2.40
         MINIMUM          55468       10.8       0.48       0.10       0.06                  0.20
         MEAN             55468       13.8       1.16       0.92       0.16                  0.95
99/99/99
```

```
STORET RETRIEVAL DATE 71/11/11
                                                            TR05
                                                            41 58 32.0 071 11 02.0
                                                            TAUNTON RIVER BASIN
                                                            00 MASSACHUSETTS
                                                            NORTHEAST (01)
                                                            NARRAGANSET BAY (06) MOUNT HOPE BAY
                                                            1111REG1               2111204
                                                            2                      0000 FEET  DEPTH

                             00010      00300      00310     31501     31616
  DATE    TIME DEPTH         WATER       DO        BOD     TOT COLI  FEC COLI
  FROM     OF                TEMP                 5 DAY   MFIMENDO  MFM-FCBR
   TO     DAY   FEET         CENT        MG/L      MG/L    /100ML    /100ML

00/00/00
STATION   MAXIMUM             23.5        6.9       7.0    100000        66
          MINIMUM             21.0        5.9       3.0     19000        20
          MEAN                22.6        6.3       4.3     54800        41
99/99/99

                             00403      00080     00070     00500     00505     00530     00535     00410
  DATE    TIME DEPTH          LAB       COLOR      TURB    RESIDUE   RESIDUE   RESIDUE   RESIDUE    T ALK
  FROM     OF                 PH        PT-CO      JKSN     TOTAL    TOT VOL   TOT NFLT  VOL NFLT   CACO3
   TO     DAY   FEET          SU        UNITS       JU       MG/L      MG/L      MG/L      MG/L      MG/L

00/00/00
STATION   MAXIMUM              7.1         45      10.0       188        85        30        29        13
          MINIMUM              6.7         25       2.9       137        55        10        10        12
          MEAN                 6.9         38       6.3       160        69        22        19        13
99/99/99

                             60050      32230     00665     00625     00610     00615     00630
  DATE    TIME DEPTH         ALGAE     CHLRPHYL   PHOS-T   TOT KJEL  AMMONIA   NITRITE   NO2&NO3
  FROM     OF                TOTAL        A       P-WET       N       NH3-N     NO2-N       N
   TO     DAY   FEET          /ML        MG/L      MG/L      MG/L      MG/L      MG/L      MG/L

00/00/00
STATION   MAXIMUM            57166       16.3      1.36      1.50      0.40                0.84
          MINIMUM            57166        8.4      0.52      0.60      0.08                0.16
          MEAN               57166       12.7      1.00      0.96      0.20                0.51
99/99/99
```

```
STORET RETRIEVAL DATE 71/11/11
                                                                    TR05
                                                                    41 57 21.0 071 10 04.0
                                                                    TAUNTON RIVER BASIN
                                                                    00 MASSACHUSETTS
                                                                    NORTHEAST #01<
                                                                    NARRAGANSET BAY#06<  MOUNT HOPE BAY
                                                                    1111REG1                2111204
                                                                    2                       0000 FEET  DEPTH

                            00010      00300      00310      31501      31616
  DATE    TIME DEPTH     WATER        DO         BOD       TOT COLI   FEC COLI
  FROM     OF             TEMP                    5 DAY     MFIMENDO   MFM-FCBR
   TO     DAY   FEET      CENT        MG/L       MG/L      /100ML     /100ML

00/00/00
STATION  MAXIMUM          24.0         5.8        4.0      60000        360
         MINIMUM          21.0         4.5        2.0       8100         50
         MEAN             22.9         5.1        2.9      24060        138
99/99/99

                           00403      00080      00070      00500      00505      00530      00535      00410
  DATE    TIME DEPTH     LAB        COLOR       TURB      RESIDUE    RESIDUE    RESIDUE    RESIDUE    T ALK
  FROM     OF             PH        PT-CO       JKSN      TOTAL      TOT VOL    TOT NFLT   VOL NFLT   CACO3
   TO     DAY   FEET      SU        UNITS       JU        MG/L       MG/L       MG/L       MG/L       MG/L

00/00/00
STATION  MAXIMUM           6.8         50        6.1        196        103         24         22         16
         MINIMUM           6.7         33        2.6        134         48          8          8         12
         MEAN              6.8         42        4.5        160         66         19         16         13
99/99/99

                          60050      32230      00665      00625      00610      00615      00630
  DATE    TIME DEPTH     ALGAE      CHLRPHYL    PHOS-T    TOT KJEL   AMMONIA    NITRITE    NO2&NO3
  FROM     OF            TOTAL         A        P-WET        N       NH3-N      NO2-N        N
   TO     DAY   FEET     /ML         MG/L       MG/L       MG/L       MG/L       MG/L       MG/L

00/00/00
STATION  MAXIMUM         39846       10.5       2.72       1.90       0.48                  0.96
         MINIMUM         39846        6.8       0.68       0.20       0.08                  0.68
         MEAN            39846        9.0       1.17       1.26       0.22                  0.83
99/99/99
```

```
STORET RETRIEVAL DATE 71/11/11
                                                                 TR07
                                                                 41 57 00.0 071 13 39.0
                                                                 TAUNTON RIVER BASIN
                                                                 00 MASSACHUSETTS
                                                                 NORTHEAST (01)
                                                                 NARRAGANSET BAY (06) MOUNT HOPE BAY
                                                                 1111REG1             2111204
                                                                 2                   0000 FEET  DEPTH

                          00010     00300     00310     31501     31616
 DATE    TIME DEPTH   WATER        DO       BOD     TOT COLI  FEC COLI
 FROM     OF           TEMP                 5 DAY   MFIMENDO  MFM-FCBR
  TO     DAY   FEET    CENT        MG/L      MG/L    /100ML    /100ML

00/00/00
STATION  MAXIMUM       24.5        6.8       3.0     50000        20
         MINIMUM       22.0        5.4       1.0      1200         4
         MEAN          23.4        6.0       1.7     12860         9
99/99/99

                          00403     00080     00070     00500     00505     00530     00535     00410
 DATE    TIME DEPTH    LAB        COLOR      TURB    RESIDUE   RESIDUE   RESIDUE   RESIDUE    T ALK
 FROM     OF           PH         PT-CO      JKSN     TOTAL    TOT VOL   TOT NFLT  VOL NFLT   CACO3
  TO     DAY   FEET    SU         UNITS       JU      MG/L      MG/L      MG/L      MG/L      MG/L

00/00/00
STATION  MAXIMUM        6.8        225       9.7       151        87        24        16        10
         MINIMUM        6.7        225       0.0       108        50         5         5         7
         MEAN           6.8        225       6.6       132        64        13         9         9
99/99/99

                          60050     32230     00665     00625     00610     00615     00630
 DATE    TIME DEPTH   ALGAE      CHLRPHYL   PHOS-T   TOT KJEL  AMMONIA   NITRITE   NO2&NO3
 FROM     OF          TOTAL         A       P-WET       N       NH3-N     NO2-N       N
  TO     DAY   FEET    /ML         MG/L      MG/L      MG/L      MG/L      MG/L      MG/L

00/00/00
STATION  MAXIMUM       7528        8.2      1.72      5.00      0.30                1.24
         MINIMUM       7528        3.1      1.16      0.60      0.07                0.14
         MEAN          7528        6.3      1.50      1.86      0.20                0.60
99/99/99
```

```
STORET RETRIEVAL DATE 71/11/11
                                                                         TRON
                                                                         41 56 47.0 071 12 10.0
                                                                         TAUNTON RIVER BASIN
                                                                         00 MASSACHUSETTS
                                                                         NORTHEAST (01)
                                                                         NARRAGANSETT BAY (06) MOUNT HOPE BAY
                                                                         11118001              2111204
                                                                                               0000 FEET  DEPTH

                          00010      00300      00310      31501      31616
  DATE    TIME DEPTH      WATER       DO         BOD      TOT COLI   FEC COLI
  FROM     OF             TEMP                  5 DAY     MFIMENDO   MFM-FCBR
   TO     DAY  FEET       CENT       MG/L       MG/L      /100ML     /100ML

00/00/00
STATION   MAXIMUM          25.0       7.6        4.0      61000        270
          MINIMUM          22.0       4.2        1.1       4300          2
          MEAN             23.4       5.9        1.3      23780         60
99/99/99

                          00400      00080      00070      00500      00505      00530      00535      00410
  DATE    TIME DEPTH       PH        COLOR      TURB     RESIDUE    RESIDUE    RESIDUE    RESIDUE    T ALK
  FROM     OF                        PT-CO      JKSN      TOTAL     TOT VOL    TOT NFLT   VOL NFLT   CACO3
   TO     DAY  FEET        SU        UNITS       JU        MG/L       MG/L       MG/L       MG/L       MG/L

00/00/00
STATION   MAXIMUM           6.9        100        2.4        168        101         11          7         13
          MINIMUM           6.1         40        1.4        100         43          1          1          5
          MEAN              6.5         55        2.1        125         61          6          4         10
99/99/99

                          60050      32230      00665      00625      00610      00615      00630
  DATE    TIME DEPTH      ALGAE     CHLRPHYL    PHOS-T   TOT KJEL    AMMONIA    NITRITE    NO2&NO3
  FROM     OF             TOTAL        A        P-WET        N       NH3-N      NO2-N         N
   TO     DAY  FEET        /ML       MG/L       MG/L       MG/L       MG/L       MG/L       MG/L

00/00/00
STATION   MAXIMUM          4415        3.4       4.40       2.50       0.40                  1.20
          MINIMUM          4415        2.6       0.49       0.20       0.08                  0.44
          MEAN             4415        3.0       1.58       1.04       0.22                  0.77
99/99/99

                          74010      01032      00720      71900
  DATE    TIME DEPTH       IRON     CHROMIUM   CYANIDE    MERCURY
  FROM     OF               FE      HEX-VAL       CN      HG,TOTAL
   TO     DAY  FEET        MG/L       UG/L       MG/L       UG/L

00/00/00
STATION   MAXIMUM                               0.50
          MINIMUM                               0.50
          MEAN                                  0.50
99/99/99
```

D-9

```
STORET RETRIEVAL DATE 71/11/11
                                                                              TR09
                                                                             41 56 50.0 071 10 39.0
                                                                             TAUNTON RIVER BASIN
                                                                             00 MASSACHUSETTS
                                                                             NORTHEAST (01)
                                                                             NARRAGANSET BAY (06) MOUNT HOPE BAY
                                                                             1111REG1              2111240
                                                                             2                     0000 FEET  DEPTH

                              00010      00300      00310      31501      31616
  DATE     TIME DEPTH         WATER       DO        BOD       TOT COLI   FEC COLI
  FROM      OF                TEMP                 5 DAY      MFIMENDO   MFM-FCBR
   TO      DAY   FEET         CENT       MG/L       MG/L      /100ML     /100ML

00/00/00
STATION   MAXIMUM              24.0        7.1       33.0    5000000      50000
          MINIMUM              21.0        4.1        1.0       4900          6
          MEAN                 22.8        6.2        5.8    1055787      12035
99/99/99

                              00403      00080      00070      00500      00505      00530      00535      00410
  DATE     TIME DEPTH         LAB        COLOR      TURB      RESIDUE    RESIDUE    RESIDUE    RESIDUE     T ALK
  FROM      OF                 PH        PT-CO      JKSN       TOTAL     TOT VOL    TOT NFLT   VOL NFLT    CACO3
   TO      DAY   FEET          SU        UNITS       JU         MG/L       MG/L       MG/L       MG/L       MG/L

00/00/00
STATION   MAXIMUM               6.8        110        2.7        167         71         12          7         25
          MINIMUM               6.6         80        1.6         92         40          1          1          5
          MEAN                  6.7         91        2.1        131         59          6          4         14
99/99/99

                              60050      32230      00665      00625      00610      00615      00630
  DATE     TIME DEPTH         ALGAE      CHLRPHYL   PHOS-T    TOT KJEL   AMMONIA    NITRITE    NO2&NO3
  FROM      OF                TOTAL         A       P-WET        N        NH3-N      NO2-N        N
   TO      DAY   FEET          /ML        MG/L       MG/L       MG/L       MG/L       MG/L       MG/L

00/00/00
STATION   MAXIMUM              2038        3.7       1.00       1.30       0.40                  1.52
          MINIMUM              2038        1.8       0.08       0.10       0.07                  0.42
          MEAN                 2038        2.5       0.54       0.58       0.24                  0.73
99/99/99
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STORET RETRIEVAL DATE 71/11/11
                                                                                  TR10
                                                                                 41 56 01.0 071 09 16.0
                                                                                 TAUNTON RIVER BASIN
                                                                                 00 MASSACHUSETTS
                                                                                 NORTHEAST (01)
                                                                                 NARRAGANSETT BAY (06) MOUNT HOPE BAY
                                                                                 1111REG1            2111204
                                                                                 2                   0000 FEET  DEPTH

                              00010      00300      00310      31501      31616
  DATE    TIME DEPTH         WATER        DO         BOD      TOT COLI   FEC COLI
  FROM     OF                TEMP                   5 DAY     MFIMENDO   MFM-FCBR
   TO     DAY   FEET         CENT        MG/L       MG/L      /100ML     /100ML

00/00/00
STATION   MAXIMUM            23.5         5.8        3.0      16000        170
          MINIMUM            21.0         4.7        1.0       5400         30
          MEAN               22.7         5.2        2.1      11280        106
99/99/99

                              00403      00080      00070      00500      00505      00530      00535      00410
  DATE    TIME DEPTH          LAB        COLOR       TURB     RESIDUE    RESIDUE    RESIDUE    RESIDUE     T ALK
  FROM     OF                  PH        PT-CO       JKSN      TOTAL     TOT VOL    TOT NFLT   VOL NFLT    CACO3
   TO     DAY   FEET           SU        UNITS        JU       MG/L       MG/L       MG/L       MG/L       MG/L

00/00/00
STATION   MAXIMUM             6.7          60        4.4        221        129         12         11         13
          MINIMUM             3.5          40        1.7        124         46          2          2          9
          MEAN                6.0          51        2.9        155         74          7          5         11
99/99/99

                              60050      32230      00665      00625      00610      00615      00630
  DATE    TIME DEPTH         ALGAE      CHLRPHYL    PHOS-T    TOT KJEL   AMMONIA    NITRITE    NO2&NO3
  FROM     OF                TOTAL         A        P-WET        N        NH3-N      NO2-N        N
   TO     DAY   FEET          /ML        MG/L       MG/L       MG/L       MG/L       MG/L       MG/L

00/00/00
STATION   MAXIMUM            24112       10.4       1.00       1.40                              9.92
          MINIMUM            24112        2.9       0.60       0.30       0.08                   0.48
          MEAN               24112        6.5       0.73       0.90                              2.75
99/99/99
```

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STORET RETRIEVAL DATE 71/11/11
                                                                          TR11
                                                                         41 54 54.0 071 08 16.0
                                                                         TAUNTON RIVER BASIN
                                                                         00 MASSACHUSETTS
                                                                         NORTHEAST (01)
                                                                         NARRAGANSET BAY (06) MOUNT HOPE BAY
                                                                         1111REG1             2111204
                                                                         2                    0000 FEET  DEPTH

                              00010     00300     00310     31501     31616
  DATE    TIME DEPTH   WATER      DO       BOD     TOT COLI  FEC COLI
  FROM     OF          TEMP               5 DAY    MFIMENDO  MFM-FCBR
   TO     DAY   FEET   CENT      MG/L     MG/L     /100ML    /100ML

00/00/00
STATION   MAXIMUM        23.0       8.2       4.0     75000       100
          MINIMUM        21.5       5.5       2.0     10000        10
          MEAN           22.5       6.6       2.5     26000        48
99/99/99

                              00403     00080     00070     00500     00505     00530     00535     00410
  DATE    TIME DEPTH   LAB       COLOR      TURB    RESIDUE   RESIDUE   RESIDUE   RESIDUE    T ALK
  FROM     OF           PH       PT-CO      JKSN     TOTAL    TOT VOL   TOT NFLT  VOL NFLT   CACO3
   TO     DAY   FEET    SU       UNITS       JU      MG/L      MG/L      MG/L      MG/L      MG/L

00/00/00
STATION   MAXIMUM         6.8        65       3.6       179        96        13        10        14
          MINIMUM         6.2        43       1.3       118        39         4         4        12
          MEAN            6.5        57       2.7       138        57         8         7        13
99/99/99

                              60050     32230     00665     00625     00610     00615     00630
  DATE    TIME DEPTH   ALGAE    CHLRPHYL   PHOS-T   TOT KJEL  AMMONIA   NITRITE   NO2&NO3
  FROM     OF          TOTAL       A       P-WET       N      NH3-N     NO2-N       N
   TO     DAY   FEET   /ML       MG/L      MG/L      MG/L      MG/L      MG/L      MG/L

00/00/00
STATION   MAXIMUM       21451       7.4      0.84      3.80      0.40                0.92
          MINIMUM       21451       4.6      0.48      0.20      0.08                0.28
          MEAN          21451       5.8      0.66      1.40      0.20                0.62
99/99/99
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STORET RETRIEVAL DATE 71/11/11
                                                                                        TR12
                                                                                        41 53 10.0 071 08 01.0
                                                                                        TAUNTON RIVER BASIN
                                                                                        00 MASSACHUSETTS
                                                                                        NORTHEAST (01)
                                                                                        NARRAGANSET BAY (06) MOUNT HOPE BAY
                                                                                        1111REG1              2111204
                                                                                        2                     0000 FEET  DEPTH

                              00010       00300       00310       31501      31616
  DATE     TIME DEPTH      WATER          DO          BOD       TOT COLI   FEC COLI
  FROM      OF             TEMP                       5 DAY     MFIMENDO   MFM-FCBR
   TO      DAY   FEET      CENT         MG/L        MG/L       /100ML     /100ML

00/00/00
STATION   MAXIMUM           23.0         7.1         3.0      160000        280
          MINIMUM           20.5         6.0         1.0        9900         10
          MEAN              22.2         6.5         2.5       45980        156
99/99/99

                            00403       00080       00070       00500      00505      00530      00535      00410
  DATE     TIME DEPTH      LAB         COLOR        TURB      RESIDUE    RESIDUE    RESIDUE    RESIDUE    T ALK
  FROM      OF             PH          PT-CO        JKSN       TOTAL     TOT VOL    TOT NFLT   VOL NFLT   CACO3
   TO      DAY   FEET      SU          UNITS        JU         MG/L       MG/L       MG/L       MG/L       MG/L

00/00/00
STATION   MAXIMUM            6.9          60         3.3         157         79         13         12         13
          MINIMUM            6.5          45         1.3         108         41          2          2          9
          MEAN               6.7          56         2.6         136         54          9          8         12
99/99/99

                            60050       32230       00665       00625      00610      00615      00630
  DATE     TIME DEPTH      ALGAE       CHLRPHYL     PHOS-T    TOT KJEL   AMMONIA    NITRITE    NO2&NO3
  FROM      OF             TOTAL          A         P-WET        N        NH3-N      NO2-N        N
   TO      DAY   FEET      /ML          MG/L        MG/L       MG/L       MG/L       MG/L       MG/L

00/00/00
STATION   MAXIMUM          22216         8.1        0.72        2.80       0.32                  1.00
          MINIMUM          22216         4.2        0.52        0.30       0.06                  0.20
          MEAN             22216         6.8        0.66        1.00       0.19                  0.55
99/99/99
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STORET RETRIEVAL DATE 71/11/11
                                                                       TR13
                                                                       41 52 04.0 071 07 47.0
                                                                       TAUNTON RIVER BASIN      *
                                                                       00 MASSACHUSETTS
                                                                       NORTHEAST *01<
                                                                       NARRAGANSET BAY*06<  MOUNT HOPE BAY
                                                                       1111REG1             2111204
                                                                       2                   0000 FEET  DEPTH

                         00010     00300     00310      31501      31616
  DATE    TIME DEPTH     WATER      DO        BOD      TOT COLI   FEC COLI
  FROM     OF             TEMP               5 DAY     MFIMENDO   MFM-FCBR
   TO     DAY  FEET       CENT      MG/L      MG/L      /100ML     /100ML

00/00/00
STATION  MAXIMUM           23.5       8.7       4.0      46000       1900
         MINIMUM           21.0       5.7       2.0      16000         10
         MEAN              22.6       7.4       2.6      30000        432
99/99/99


                         00403     00080     00070     00500      00505      00530      00535      00410
  DATE    TIME DEPTH     LAB       COLOR     TURB      RESIDUE    RESIDUE    RESIDUE    RESIDUE    T ALK
  FROM     OF             PH       PT-CO     JKSN       TOTAL     TOT VOL    TOT NFLT   VOL NFLT   CACO3
   TO     DAY  FEET       SU       UNITS      JU         MG/L       MG/L       MG/L       MG/L      MG/L

00/00/00
STATION  MAXIMUM            6.9        65       3.3        159         78         11         11         14
         MINIMUM            6.5        45       1.0        110         42          2          2         10
         MEAN               6.7        60       2.5        136         57          8          7         12
99/99/99


                         60050     32230     00665     00625      00610      00615      00630
  DATE    TIME DEPTH     ALGAE     CHLRPHYL  PHOS-T    TOT KJEL   AMMONIA    NITRITE    NO2&NO3
  FROM     OF            TOTAL       A       P-WET       N        NH3-N      NO2-N        N
   TO     DAY  FEET       /ML       MG/L      MG/L      MG/L       MG/L       MG/L       MG/L

00/00/00
STATION  MAXIMUM          24508       7.6      1.60       2.00       0.36                  1.20
         MINIMUM          24508       4.6      0.52       0.10       0.07                  0.04
         MEAN             24508       6.5      0.88       0.76       0.19                  0.57
99/99/99
```

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STORET RETRIEVAL DATE 71/11/11
                                                                      TR14
                                                                      41 51 46.0 071 07 25.0
                                                                      TAUNTON RIVER BASIN
                                                                      06 MASSACHUSETTS
                                                                      NORTHEAST 0105
                                                                      NARRAGANSETT BAY065  MOUNT HOPE BAY
                                                                      1111REG1             2111204
                                                                      2                    0000 FEET  DEPTH

                          00010      00300      00310      31501      31616
  DATE     TIME DEPTH     WATER       DO         BOD      TOT COLI   FEC COLI
  FROM      OF            TEMP                  5 DAY     MFIMENDO   MFM-FCBR
   TO      DAY  FEET      CENT       MG/L       MG/L      /100ML     /100ML

00/00/00
STATION   MAXIMUM         23.5        8.8        4.0      48000        980
          MINIMUM         21.5        7.4        1.0        500         10
          MEAN            22.4        7.7        2.1      24500        510
99/99/99

                          00403      00080      00070      00500      00505      00530      00535      00410
  DATE     TIME DEPTH     LAB        COLOR      TURB      RESIDUE    RESIDUE    RESIDUE    RESIDUE    T ALK
  FROM      OF            PH         PT-CO      JKSN       TOTAL     TOT VOL    TOT NFLT   VOL NFLT   CACO3
   TO      DAY  FEET      SU         UNITS       JU        MG/L       MG/L       MG/L       MG/L       MG/L

00/00/00
STATION   MAXIMUM          6.8         65        3.6        194         93         12         11         14
          MINIMUM          6.5         45        1.3        118         40          7          7         12
          MEAN             6.7         61        2.5        141         57          9          9         13
99/99/99

                          60050      32230      00665      00625      00610      00615      00630
  DATE     TIME DEPTH     ALGAE     CHLRPHYL   PHOS-T    TOT KJEL   AMMONIA    NITRITE    NO2&NO3
  FROM      OF            TOTAL        A        P-WET        N        NH3-N      NO2-N        N
   TO      DAY  FEET       /ML        MG/L       MG/L       MG/L       MG/L       MG/L       MG/L

00/00/00
STATION   MAXIMUM        22736       10.4       0.68       0.90       0.36                  0.72
          MINIMUM        22736        4.0       0.56       0.10       0.06                  0.20
          MEAN           22736        6.4       0.62       0.63       0.21                  0.50
99/99/99

                          74010      01032      00720      71900
  DATE     TIME DEPTH     IRON      CHROMIUM   CYANIDE    MERCURY
  FROM      OF             FE       HEX-VAL      CN       HG,TOTAL
   TO      DAY  FEET      MG/L       UG/L       MG/L       UG/L

00/00/00
STATION   MAXIMUM                               0.50
          MINIMUM                               0.50
          MEAN                                  0.50
99/99/99
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STORET RETRIEVAL DATE 71/11/11
                                                                    TR15
                                                                    42 03 16.0 071 00 36.0
                                                                    TAUNTON RIVER BASIN
                                                                    00 MASSACHUSETTS
                                                                    NORTHEAST 01C
                                                                    NARRAGANSET BAY 06C  MOUNT HOPE BAY
                                                                    111MEGI              2111204
                                                                    2                    0000 FEET  DEPTH
                                   00010     00300     00310     31501     31616
  DATE     TIME DEPTH  WATER       DO        BOD      TOT COLI  FEC COLI
  FROM      OF         TEMP                  5 DAY    MFIMENDO  MFM-FCBR
   TO      DAY  FEET   CENT       MG/L      MG/L      /100ML    /100ML

00/00/00
STATION  MAXIMUM        20.0        4.5      12.0     410000      2300
         MINIMUM        17.5        2.3       1.0      10000        10
         MEAN           18.6        3.3       3.2     138000       730
99/99/99

                        70403     00080     00070     00500     00505     00530     00535     00410
  DATE     TIME DEPTH   LAB       COLOR     TURB      RESIDUE   RESIDUE   RESIDUE   RESIDUE   T ALK
  FROM      OF          PH        PT-CO     JKSN      TOTAL     TOT VOL   TOT NFLT  VOL NFLT  CACO3
   TO      DAY  FEET    SU        UNITS     JU        MG/L      MG/L      MG/L      MG/L      MG/L

00/00/00
STATION  MAXIMUM        6.9         40       4.4       265        82        15         6        30
         MINIMUM        6.4         23       2.2       200        46         2         2        22
         MEAN           6.6         26       3.7       229        59         4         4        24
99/99/99

                        60050     32230     00665     00625     00610     00615     00630
  DATE     TIME DEPTH   ALGAE     CHLRPHYL  PHOS-T    TOT KJEL  AMMONIA   NITRITE   NO2&NO3
  FROM      OF          TOTAL     A         P-WET     N         NH3-N     NO2-N     N
   TO      DAY  FEET    /ML       MG/L      MG/L      MG/L      MG/L      MG/L      MG/L

00/00/00
STATION  MAXIMUM        1014       1.1      4.08      1.50      1.44                2.29
         MINIMUM        1014       0.4      0.44      0.70      0.08                1.16
         MEAN           1014       0.7      1.35      0.97      0.31                1.71
99/99/99

                        74010     01032     00720     71900
  DATE     TIME DEPTH   IRON      CHROMIUM  CYANIDE   MERCURY
  FROM      OF          FE        HEX-VAL   CN        HG,TOTAL
   TO      DAY  FEET    MG/L      UG/L      MG/L      UG/L

00/00/00
STATION  MAXIMUM        1.5       0.20
         MINIMUM        1.1       0.20
         MEAN           1.3       0.20
99/99/99
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STORET RETRIEVAL DATE 71/11/21

                                                                   TWIN
                                                                   41 01 34.0 070 58 34.0
                                                                   TAUNTON RIVER BASIN
                                                                   25 MASSACHUSETTS
                                                                   NORTHEAST (01)
                                                                   NARRAGANSETT NATIONAL  MOUNT HOPE BAY
                                                                   111MF01              2111240
                                                                                      0000 FEET  DEPTH

                        00010      00300      00310       31501      31616
 DATE    TIME  DEPTH   WATER       DO         BOD       TOT COLI   FEC COLI
 FROM     OF           TEMP                  5 DAY      MFIMENDO   MFM-FCBR
  TO     DAY  FEET     CENT       MG/L       MG/L       /100ML     /100ML

00/00/00
STATION  MAXIMUM        [illegible] [illegible] 18.0     1400000    [illegible]
         MINIMUM        [illegible] [illegible] 7.0      120000     470
         MEAN           [illegible] [illegible] [illegible] 430000  [illegible]
99/99/99

 [illegible]
 DATE    TIME  DEPTH                                      RESIDUE    RESIDUE    RESIDUE    RESIDUE     T ALK
 FROM     OF                                               TOTAL     TOT VOL    TOT NFLT   VOL NFLT    CACO3
  TO     DAY  FEET                                         MG/L       MG/L       MG/L       MG/L       MG/L

00/00/00
STATION  MAXIMUM        [illegible]                                                          22          80
         MINIMUM        [illegible]                                                                      60
         MEAN           [illegible]                                                          11          71
99/99/99

 [illegible]
 DATE    TIME  DEPTH   [illegible]                                    AMMONIA
 FROM     OF                                                          NH3-N
  TO     DAY  FEET                                                    MG/L

00/00/00
STATION  MAXIMUM        [illegible]                                                          [illegible]
         MINIMUM        [illegible]                                   2.80                   .40
         MEAN           [illegible]                                   4.74                   1.40
99/99/99

                        [illegible] [illegible] [illegible]  71900
 DATE    TIME  DEPTH    IRON      CHROMIUM    [illegible]   MERCURY
 FROM     OF            FE        HEX-VAL      [illegible]   HG,TOTAL
  TO     DAY  FEET      MG/L       UG/L        MG/L           UG/L

00/00/00
STATION  MAXIMUM        1.9        0.20
         MINIMUM        1.3        0.20
         MEAN           1.5        0.20
99/99/99
```

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STORET RETRIEVAL DATE 71/11/11

                                                                         TR17
                                                                        42 01 19.0 070 54 34.0
                                                                        TAUNTON RIVER BASIN
                                                                        25 MASSACHUSETTS
                                                                        NORTHEAST (01)
                                                                        NARRAGANSET BAY(06)  MOUNT HOPE BAY
                                                                        1111REG1              2111240
                                                                        2                    0000 FEET  DEPTH

                            00010      00300      00310      31501      31616
  DATE      TIME DEPTH     WATER        DO        BOD      TOT COLI   FEC COLI
  FROM       OF             TEMP                 5 DAY    MFIMENDO   MFM-FCBR
   TO       DAY   FEET      CENT        MG/L      MG/L      /100ML     /100ML
00/00/00
STATION   MAXIMUM           27.5        2.8       17.0     900000       2800
          MINIMUM           19.5        0.2        5.0     630000        490
          MEAN              22.4        1.0       11.7     710000       1316
99/99/99

                            00403      00080      00070      00500      00505      00530      00535      00410
  DATE      TIME DEPTH       LAB       COLOR      TURB     RESIDUE    RESIDUE    RESIDUE    RESIDUE     T ALK
  FROM       OF              PH        PT-CO      JKSN      TOTAL     TOT VOL    TOT NFLT   VOL NFLT    CACO3
   TO       DAY   FEET       SU        UNITS       JU        MG/L       MG/L       MG/L       MG/L       MG/L
00/00/00
STATION   MAXIMUM            7.2         70        6.6        287         87         19         18         72
          MINIMUM            7.0         50        1.8        222         52         11         10         65
          MEAN               7.1         55        3.6        251         65         16         14         69
99/99/99

                            60050      32230      00665      00625      00610      00615      00630
  DATE      TIME DEPTH      ALGAE     CHLRPHYL   PHOS-T    TOT KJEL   AMMONIA    NITRITE    NO2&NO3
  FROM       OF             TOTAL        A       P-WET        N       NH3-N      NO2-N        N
   TO       DAY   FEET       /ML        MG/L      MG/L       MG/L       MG/L       MG/L       MG/L
00/00/00
STATION   MAXIMUM           3674        4.7      20.44      10.70       5.76                  1.20
          MINIMUM           3674        1.4       7.80       2.30       4.00                  0.28
          MEAN              3674        3.5      12.06       7.48       5.24                  0.68
99/99/99

                            74010      01032      00720      71900
  DATE      TIME DEPTH      IRON     CHROMIUM    CYANIDE    MERCURY
  FROM       OF              FE       HEX-VAL      CN      HG,TOTAL
   TO       DAY   FEET      MG/L       UG/L       MG/L       UG/L
00/00/00
STATION   MAXIMUM            1.6       0.20
          MINIMUM            1.1       0.20
          MEAN               1.5       0.20
99/99/99
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STORET RETRIEVAL DATE 71/11/11
                                                                            TR18
                                                                            42 00 23.0 070 56 50.0
                                                                            TAUNTON RIVER BASIN
                                                                            00 MASSACHUSETTS
                                                                            NORTHEAST #01<
                                                                            NARRAGANSET BAY#06<  MOUNT HOPE BAY
                                                                            1111REGI             2111204
                                                                            2                    0000 FEET  DEPTH

                         00010      00300      00310      31501     31616
 DATE    TIME DEPTH     WATER        DO        BOD      TOT COLI  FEC COLI
 FROM     OF             TEMP                  5 DAY    MFIMENDO  MFM-FCBR
  TO     DAY  FEET       CENT       MG/L       MG/L      /100ML    /100ML

00/00/00
STATION  MAXIMUM          24.0        2.1       35.0     120000       210
         MINIMUM          20.5        0.9        4.0      37000        90
         MEAN             21.6        1.6        7.9      73800       128
99/99/99

                         00403      00080      00070      00500     00505     00530     00535     00410
 DATE    TIME DEPTH      LAB        COLOR      TURB      RESIDUE   RESIDUE   RESIDUE   RESIDUE    T ALK
 FROM     OF             PH         PT-CO      JKSN       TOTAL    TOT VOL   TOT NFLT  VOL NFLT   CACO3
  TO     DAY  FEET       SU         UNITS       JU        MG/L      MG/L      MG/L      MG/L      MG/L

00/00/00
STATION  MAXIMUM          7.2         70        5.3        247        79        71        11        57
         MINIMUM          6.9         60        1.4        188        42         7         4        53
         MEAN             7.0         67        2.9        207        56        23         8        55
99/99/99

                         60050      32230      00665      00625     00610     00615     00630
 DATE    TIME DEPTH      ALGAE     CHLRPHYL    PHOS-T    TOT KJEL  AMMONIA   NITRITE   NO2&NO3
 FROM     OF             TOTAL        A        P-WET        N       NH3-N     NO2-N       N
  TO     DAY  FEET        /ML        MG/L       MG/L       MG/L      MG/L      MG/L      MG/L

00/00/00
STATION  MAXIMUM          2038        7.6      10.24       9.20      6.00                1.60
         MINIMUM          2038        2.2       6.40       3.50      4.00                0.16
         MEAN             2038        3.3       7.84       7.18      5.40                0.85
99/99/99

                         74010      01032      00720      71900
 DATE    TIME DEPTH      IRON      CHROMIUM   CYANIDE    MERCURY
 FROM     OF              FE       HEX-VAL      CN       HG.TOTAL
  TO     DAY  FEET       MG/L       UG/L       MG/L       UG/L

00/00/00
STATION  MAXIMUM           1.7       0.20
         MINIMUM           1.3       0.20
         MEAN              1.5       0.20
99/99/99
```

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STORET RETRIEVAL DATE 71/11/11
                                                                                TR19
                                                                                41 59 43.0 070 56 35.0
                                                                                TAUNTON RIVER BASIN
                                                                                00 MASSACHUSETTS
                                                                                NORTHEAST #01<
                                                                                NARRAGANSET BAY#06<  MOUNT HOPE BAY
                                                                                1111REGI             2111204
                                                                                2                   0000 FEET  DEPTH

                         00010     00300     00310     31501     31616
  DATE    TIME DEPTH   WATER       DO        BOD     TOT COLI  FEC COLI
  FROM     OF          TEMP                 5 DAY    MFIMENDO  MFM-FCBR
   TO     DAY   FEET   CENT       MG/L      MG/L     /100ML    /100ML

00/00/00
STATION  MAXIMUM        25.5       9.0      16.0   4000000        86
         MINIMUM        21.0       2.6       1.0     41000        24
         MEAN           22.5       5.1       7.2   1062200        49
99/99/99


                         00403     00080     00070     00500     00505     00530     00535     00410
  DATE    TIME DEPTH   LAB       COLOR      TURB    RESIDUE   RESIDUE   RESIDUE   RESIDUE    T ALK
  FROM     OF          PH        PT-CO      JKSN     TOTAL    TOT VOL   TOT NFLT  VOL NFLT   CACO3
   TO     DAY   FEET   SU        UNITS       JU      MG/L      MG/L      MG/L      MG/L      MG/L

00/00/00
STATION  MAXIMUM         7.1        75       3.6       234        85        17        12        55
         MINIMUM         6.8        65       1.1       189        40        10         7        48
         MEAN            7.0        70       2.2       211        58        14        10        51
99/99/99


                         60050     32230     00665     00625     00610     00615     00630
  DATE    TIME DEPTH   ALGAE     CHLRPHYL   PHOS-T   TOT KJEL  AMMONIA   NITRITE   NO2&NO3
  FROM     OF          TOTAL        A       P-WET       N       NH3-N     NO2-N       N
   TO     DAY   FEET   /ML        MG/L      MG/L      MG/L      MG/L      MG/L      MG/L

00/00/00
STATION  MAXIMUM        7188      12.4      9.20      8.30      6.00                0.96
         MINIMUM        7188       7.4      6.08      1.80      4.00                0.28
         MEAN           7188       9.1      7.66      6.08      5.46                0.68
99/99/99


                         74010     01032     00720     71900
  DATE    TIME DEPTH   IRON      CHROMIUM  CYANIDE   MERCURY
  FROM     OF          FE        HEX-VAL     CN      HG,TOTAL
   TO     DAY   FEET   MG/L       UG/L      MG/L      UG/L

00/00/00
STATION  MAXIMUM         1.6      0.20
         MINIMUM         1.2      0.20
         MEAN            1.4      0.20
99/99/99
```

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```
STORET RETRIEVAL DATE 71/11/11
                                                                        1R20
                                                                        41 59 48.0 070 58 24.0
                                                                      : TAUNTON RIVER BASIN
                                                                        00 MASSACHUSETTS
                                                                        NORTHEAST #01<
                                                                        NARRAGANSET BAY#06<  MOUNT HOPE BAY
                                                                        1111REG1             2111204
                                                                        2                    0000 FEET  DEPTH

                            00010      00300      00310      31501      31616
  DATE     TIME DEPTH       WATER       DO         BOD      TOT COLI   FEC COLI
  FROM      OF              TEMP                  5 DAY     MFIMENDO   MFM-FCBR
   TO      DAY   FEET       CENT       MG/L       MG/L      /100ML     /100ML

00/00/00
STATION   MAXIMUM           23.0        6.6        2.0      23000        250
          MINIMUM           20.5        5.6        0.0      18000         50
          MEAN              21.3        5.9        1.5      21600        178
99/99/99

                            00403      00080      00070      00500      00505      00530      00535      00410
  DATE     TIME DEPTH       LAB        COLOR      TURB      RESIDUE    RESIDUE    RESIDUE    RESIDUE    T ALK
  FROM      OF              PH         PT-CO      JKSN       TOTAL     TOT VOL    TOT NFLT   VOL NFLT   CACO3
   TO      DAY   FEET       SU         UNITS      JU         MG/L       MG/L       MG/L       MG/L       MG/L

00/00/00
STATION   MAXIMUM            6.6        150        3.5        176         91         17         14         10
          MINIMUM            6.3        125        1.0        131         49          3          3          9
          MEAN               6.5        143        2.0        152         66         11          7         10
99/99/99

                            60050      32230      00665      00625      00610      00615      00630
  DATE     TIME DEPTH       ALGAE      CHLRPHYL   PHOS-T    TOT KJEL    AMMONIA    NITRITE    NO2&NO3
  FROM      OF              TOTAL        A        P-WET        N        NH3-N      NO2-N        N
   TO      DAY   FEET       /ML        MG/L       MG/L        MG/L       MG/L       MG/L       MG/L

00/00/00
STATION   MAXIMUM           5490        4.3       0.88        1.40       0.32                  1.20
          MINIMUM           5490        2.1       0.44        0.30       0.04                  0.44
          MEAN              5490        3.0       0.68        0.73       0.20                  0.74
99/99/99

                            74010      01032      00720      71900
  DATE     TIME DEPTH       IRON      CHROMIUM    CYANIDE    MERCURY
  FROM      OF               FE       HEX-VAL       CN       HG,TOTAL
   TO      DAY   FEET       MG/L        UG/L       MG/L       UG/L

00/00/00
STATION   MAXIMUM            1.8        0.20
          MINIMUM            1.4        0.20
          MEAN               1.5        0.20
99/99/99
```

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STORET RETRIEVAL DATE 71/11/11
                                                                  TR21
                                                                  41 59 50.0 070 57 17.0
                                                                  TAUNTON RIVER BASIN
                                                                  00 MASSACHUSETTS
                                                                  NORTHEAST #01<
                                                                  NARRAGANSET BAY#06<  MOUNT HOPE BAY
                                                                  1111REG1                21112O4
                                                                  2                       0000 FEET  DEPTH

                       00010      00300      00310     31501     31616
 DATE   TIME DEPTH    WATER        DO        BOD     TOT COLI  FEC COLI
 FROM    OF           TEMP                  5 DAY    MFIMENDO  MFM-FCBR
  TO    DAY  FEET     CENT       MG/L       MG/L     /100ML    /100ML

00/00/00
STATION  MAXIMUM         23.0        8.1        4.0     53000       180
         MINIMUM         21.0        4.5        1.0     12000        10
         MEAN            21.9        5.7        2.3     25000       108
99/99/99


                       00403      00080      00070     00500     00505     00530     00535     00410
 DATE   TIME DEPTH    LAB        COLOR      TURB     RESIDUE   RESIDUE   RESIDUE   RESIDUE    T ALK
 FROM    OF           PH         PT-CO      JKSN      TOTAL    TOT VOL   TOT NFLT  VOL NFLT   CACO3
  TO    DAY  FEET     SU         UNITS       JU       MG/L      MG/L      MG/L      MG/L      MG/L

00/00/00
STATION  MAXIMUM          6.6        150        4.7       178        81        22        15        15
         MINIMUM          6.3        125        1.2       149        57         9         8        11
         MEAN             6.4        143        2.1       162        67        13        11        13
99/99/99


                       60051      32230      00665     00625     00610     00615     00630
 DATE   TIME DEPTH    ALGAE      CHLRPHYL   PHOS-T   TOT KJEL   AMMONIA   NITRITE   NO2&NO3
 FROM    OF           TOTAL        A        P-WET       N       NH3-N     NO2-N       N
  TO    DAY  FEET     /ML         MG/L       MG/L      MG/L      MG/L      MG/L      MG/L

00/00/00
STATION  MAXIMUM         3170        6.1       1.56      4.20      0.40                1.08
         MINIMUM         3170        1.6       1.15      0.70      0.16                0.64
         MEAN            3170        3.9       1.30      1.52      0.31                0.85
99/99/99


                       74010      01032      00720     71900
 DATE   TIME DEPTH    IRON      CHROMIUM   CYANIDE   MERCURY
 FROM    OF            FE       HEX-VAL      CN      HG,TOTAL
  TO    DAY  FEET     MG/L        UG/L      MG/L      UG/L

00/00/00
STATION  MAXIMUM          1.4       0.20
         MINIMUM          1.3       0.20
         MEAN             1.6       0.20
99/99/99
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STORET RETRIEVAL DATE 71/11/11

                                                                              TR22
                                                                              41 59 47.0 070 56 44.0
                                                                              TAUNTON RIVER BASIN
                                                                              00 MASSACHUSETTS
                                                                              NORTHEAST #01<
                                                                              NARRAGANSET BAY#06<  MOUNT HOPE BAY
                                                                              1111REG1             2111204
                                                                              2                    0000 FEET  DEPTH

                          00010     00300     00310     31501     31616
 DATE     TIME DEPTH      WATER      DO        BOD     TOT COLI  FEC COLI
 FROM      OF              TEMP               5 DAY    MFIMENDO  MFM-FCBR
  TO      DAY   FEET       CENT      MG/L      MG/L     /100ML    /100ML
00/00/00
STATION  MAXIMUM           26.0      11.8       7.0   2000000        50
         MINIMUM           23.0       5.7       3.0      5900        10
         MEAN              24.3       9.8       4.7    505780        30
99/99/99

                          00403     00080     00070     00500     00505     00530     00535     00410
 DATE     TIME DEPTH      LAB       COLOR     TURB     RESIDUE   RESIDUE   RESIDUE   RESIDUE    T ALK
 FROM      OF              PH       PT-CO     JKSN      TOTAL    TOT VOL   TOT NFLT  VOL NFLT   CACO3
  TO      DAY   FEET       SU       UNITS      JU        MG/L      MG/L      MG/L      MG/L      MG/L
00/00/00
STATION  MAXIMUM            7.4       150       2.7       187        85        16        15        21
         MINIMUM            6.5       110       0.9       154        54         4         1        12
         MEAN               6.9       129       1.6       169        62         7         8        17
99/99/99

                          60050     32230     00665     00625     00610     00615     00630
 DATE     TIME DEPTH      ALGAE    CHLRPHYL   PHOS-T   TOT KJEL  AMMONIA   NITRITE   NO2&NO3
 FROM      OF             TOTAL       A       P-WET       N       NH3-N     NO2-N       N
  TO      DAY   FEET       /ML       MG/L      MG/L      MG/L      MG/L      MG/L      MG/L
00/00/00
STATION  MAXIMUM           4641      14.6      3.12      2.50      1.04                1.32
         MINIMUM           4641       7.6      1.75      0.10      0.54                0.20
         MEAN              4641      10.2      2.42      1.62      0.82                0.82
99/99/99

                          74010     01032     00720     71900
 DATE     TIME DEPTH      IRON     CHROMIUM  CYANIDE   MERCURY
 FROM      OF              FE      HEX-VAL     CN      HG.TOTAL
  TO      DAY   FEET      MG/L       UG/L     MG/L       UG/L
00/00/00
STATION  MAXIMUM            1.4      0.20
         MINIMUM            0.7      0.20
         MEAN               1.0      0.20
99/99/99
```

```
STORET RETRIEVAL DATE 71/11/11                                          TR23
                                                                        41 59 27.0 070 56 11.0
                                                                        TAUNTON RIVER BASIN
                                                                        00 MASSACHUSETTS
                                                                        NORTHEAST 801<
                                                                        NARRAGANSET BAY#06<  MOUNT HOPE BAY
                                                                        1111REG1              2111204
                                                                        2                    0000 FEET  DEPTH

                                 00010      00300      00310      31501     31616
   DATE     TIME DEPTH   WATER        DO        BOD       TOT COLI  FEC COLI
   FROM      OF           TEMP                  5 DAY     MFIMENDO  MFM-FCHR
    TO      DAY   FEET    CENT       MG/L      MG/L      /100ML    /100ML

00/00/00
STATION   MAXIMUM          25.0        7.6        8.0    1000000       740
          MINIMUM          21.0        5.4        4.0      68000       160
          MEAN             22.9        6.7        5.1     351600       312
99/99/99

                          00403      00080      00070      00500     00505     00530     00535     00410
   DATE     TIME DEPTH   LAB        COLOR      TURB      RESIDUE   RESIDUE   RESIDUE   RESIDUE   T ALK
   FROM      OF           PH        PT-CO      JKSN      TOTAL     TOT VOL   TOT NFLT  VOL NFLT  CACO3
    TO      DAY   FEET    SU        UNITS       JU       MG/L      MG/L      MG/L      MG/L      MG/L

00/00/00
STATION   MAXIMUM          7.2        100        3.6        211        80        85        22        33
          MINIMUM          6.8         70        1.0        168        53        16        11        30
          MEAN             7.0         90        2.0        189        60        35        18        31
99/99/99

                          60050      32210      00665      00625     00610     00615     00630
   DATE     TIME DEPTH   ALGAE      CHLRPHYL   PHOS-T    TOT KJEL  AMMONIA   NITRITE   NO2&NO3
   FROM      OF           TOTAL        A       P-WET        N      NH3-N     NO2-N        N
    TO      DAY   FEET    /ML        MG/L      MG/L      MG/L      MG/L      MG/L      MG/L

00/00/00
STATION   MAXIMUM          5773        9.3       6.12       5.70      4.64                1.44
          MINIMUM          5773        7.7       4.00       4.00      2.80                0.40
          MEAN             5773        8.4       5.29       4.70      4.00                0.96
99/99/99

                          74010      01032      00720      71900
   DATE     TIME DEPTH   IRON       CHROMIUM   CYANIDE   MERCURY
   FROM      OF           FE        HEX-VAL      CN      HG,TOTAL
    TO      DAY   FEET    MG/L       UG/L       MG/L      UG/L

00/00/00
STATION   MAXIMUM          7.0       0.20
          MINIMUM          1.0       0.20
          MEAN             3.5       0.20
99/99/99
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STORET RETRIEVAL DATE 71/11/11
                                                                                    TR24
                                                                                    41 58 43.0 070 54 48.0
                                                                                    TAUNTON RIVER BASIN
                                                                                    00 MASSACHUSETTS
                                                                                    NORTHEAST #01<
                                                                                    NARRAGANSET BAY#06<  MOUNT HOPE BAY
                                                                                    1111REGI             2111204
                                                                                    2                    0000 FEET  DEPTH

                            00010      00300      00310      31501      31616
  DATE     TIME DEPTH      WATER        DO        BOD      TOT COLI   FEC COLI
  FROM      OF              TEMP                  5 DAY    MFIMENDO   MFM-FCBR
   TO      DAY   FEET       CENT       MG/L       MG/L      /100ML     /100ML

00/00/00
STATION   MAXIMUM          23.5        5.0        6.0      860000       160
          MINIMUM          20.5        3.9        2.0       22000        20
          MEAN             22.0        4.4        3.8      209400        83
99/99/99

                           00403      00080      00070      00500      00505      00530      00535      00410
  DATE     TIME DEPTH      LAB        COLOR      TURB      RESIDUE    RESIDUE    RESIDUE    RESIDUE    T ALK
  FROM      OF              PH        PT-CO      JKSN       TOTAL     TOT VOL    TOT NFLT   VOL NFLT   CACO3
   TO      DAY   FEET       SU        UNITS       JU        MG/L       MG/L       MG/L       MG/L       MG/L

00/00/00
STATION   MAXIMUM           7.1        100       16.0        248         71         80         16         40
          MINIMUM           6.8         75        3.4        100         33         10          5         30
          MEAN              6.9         87        6.1        191         53         49         11         34
99/99/99

                           60050      32230      00665      00625      00610      00615      00630
  DATE     TIME DEPTH      ALGAE     CHLRPHYL    PHOS-T   TOT KJEL    AMMONIA    NITRITE    NO2&NO3
  FROM      OF             TOTAL        A        P-WET        N        NH3-N      NO2-N        N
   TO      DAY   FEET       /ML       MG/L       MG/L       MG/L       MG/L       MG/L       MG/L

00/00/00
STATION   MAXIMUM          4560        5.9       5.40       6.60       4.64                  1.96
          MINIMUM          4560        3.5       4.00       2.00       2.00                  0.66
          MEAN             4560        4.7       4.90       4.54       3.60                  1.15
99/99/99

                           74010      01032      00720      71900
  DATE     TIME DEPTH      IRON     CHROMIUM    CYANIDE    MERCURY
  FROM      OF              FE       HEX-VAL       CN      HG.TOTAL
   TO      DAY   FEET      MG/L       UG/L       MG/L       UG/L

00/00/00
STATION   MAXIMUM           2.1       0.20
          MINIMUM           1.2       0.20
          MEAN              1.6       0.20
99/99/99
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STORET RETRIEVAL DATE 71/11/11
                                                                            TR25
                                                                            41 57 47.0 070 54 45.0
                                                                            TAUNTON RIVER BASIN
                                                                            00 MASSACHUSETTS
                                                                            NORTHEAST #01<
                                                                            NARRAGANSET BAYAUG<  MOUNT HOPE BAY
                                                                            1111REGI             2111204
                                                                            2                    0000 FEET  DEPTH

                                 00010      00300      00310      31501      31616
  DATE     TIME DEPTH           WATER        DO        BOD      TOT COLI   FEC COLI
  FROM      OF                   TEMP                  5 DAY    MFIMENDO   MFM-FCBR
   TO      DAY   FEET            CENT       MG/L       MG/L     /100ML     /100ML

00/00/00
STATION   MAXIMUM                 24.0        4.8        4.0     410000         70
          MINIMUM                 21.0        2.7        1.0      18000         34
          MEAN                    22.2        4.4        2.6     112200         49
99/99/99

                                 00403      00080      00070      00500      00505      00530      00535      00410
  DATE     TIME DEPTH            LAB        COLOR      TURB      RESIDUE    RESIDUE    RESIDUE    RESIDUE     T ALK
  FROM      OF                    PH        PT-CO      JKSN       TOTAL     TOT VOL    TOT NFLT   VOL NFLT    CACO3
   TO      DAY   FEET             SU        UNITS       JU        MG/L       MG/L       MG/L       MG/L       MG/L

00/00/00                                                                                                       23
STATION   MAXIMUM                  6.9        130       25.0        217         76         53         14         19
          MINIMUM                  6.5         80        3.2        158         51         22          7         21
          MEAN                     6.7        108        9.9        178         57         43         11
99/99/99

                                 60050      32230      00665      00625      00610      00615      00630
  DATE     TIME DEPTH            ALGAE     CHLRPHYL    PHOS-T    TOT KJEL   AMMONIA    NITRITE    NO2&NO3
  FROM      OF                   TOTAL        A        P-WET        N        NH3-N      NO2-N        N
   TO      DAY   FEET             /ML        MG/L       MG/L       MG/L       MG/L       MG/L       MG/L

00/00/00                                                                                             1.76
STATION   MAXIMUM                 3792        5.0       4.00       4.60       3.60                  0.44
          MINIMUM                 3792        2.4       3.20       3.20       0.08                  1.21
          MEAN                    3792        3.9       3.61       4.02       2.12
99/99/99

                                 74010      01032      00720      71900
  DATE     TIME DEPTH            IRON     CHROMIUM    CYANIDE    MERCURY
  FROM      OF                    FE       HEX-VAL      CN       HG,TOTAL
   TO      DAY   FEET            MG/L       UG/L       MG/L       UG/L

00/00/00
STATION   MAXIMUM                  2.6       0.20
          MINIMUM                  2.0       0.20
          MEAN                     2.3       0.20
99/99/99
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STORET RETRIEVAL DATE 71/11/11
                                                                                          1R26
                                                                                         41 56 50.0 070 56 12.0
                                                                                         TAUNTON RIVER BASIN
                                                                                         00 MASSACHUSETTS
                                                                                         NORTHEAST #01<
                                                                                         NARRAGANSET BAY#06<  MOUNT HOPE BAY
                                                                                         1111REG1               2111204
                                                                                         2                    0000 FEET  DEPTH

                             00010      00300      00310      31501      31616
  DATE     TIME DEPTH     WATER        DO        BOD      TOT COLI   FEC COLI
  FROM      OF            TEMP                  5 DAY     MFIMENDO   MFM-FCBR
   TO      DAY   FEET     CENT        MG/L      MG/L      /100ML     /100ML

00/00/00
STATION   MAXIMUM          24.5        4.6        3.0      94000         60
          MINIMUM          21.0        3.0        2.0       9400         18
           MEAN            22.5        4.0        2.1      32080         37
99/99/99

                             00403      00080      00070      00500      00505      00530      00535      00410
  DATE     TIME DEPTH      LAB        COLOR       TURB      RESIDUE    RESIDUE    RESIDUE    RESIDUE     T ALK
  FROM      OF              PH        PT-CO       JKSN       TOTAL     TOT VOL    TOT NFLT   VOL NFLT    CACO3
   TO      DAY   FEET       SU        UNITS        JU        MG/L       MG/L       MG/L       MG/L       MG/L

00/00/00
STATION   MAXIMUM           7.0        130        10.0        197         88         36         15         28
          MINIMUM           6.6        100         3.2        155         49         13          7         20
           MEAN             6.8        114         4.8        168         62         25         11         24
99/99/99

                             50050      32230      00665      00625      00610      00615      00630
  DATE     TIME DEPTH     ALGAE     CHLRPHYL     PHOS-T    TOT KJEL   AMMONIA    NITRITE    NO2&NO3
  FROM      OF            TOTAL         A         P-WET        N       NH3-N      NO2-N        N
   TO      DAY   FEET      /ML        MG/L       MG/L       MG/L       MG/L       MG/L       MG/L

00/00/00
STATION   MAXIMUM          3283        3.5       7.20       4.50       3.84                  1.36
          MINIMUM          3283        2.4       3.57       3.40       1.12                  0.56
           MEAN            3283        3.0       4.44       3.96       2.60                  1.06
99/99/99

                             74010      01032      00720      71900
  DATE     TIME DEPTH      IRON     CHROMIUM    CYANIDE    MERCURY
  FROM      OF              FE       HEX-VAL       CN      HG,TOTAL
   TO      DAY   FEET      MG/L       UG/L        MG/L       UG/L

00/00/00
STATION   MAXIMUM           2.2       0.20
          MINIMUM           1.7       0.20
           MEAN             2.0       0.20
99/99/99
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STORET RETRIEVAL DATE 71/11/11
                                                                          TR27
                                                                          41 56 16.0 070 56 35.0
                                                                          TAUNTON RIVER BASIN
                                                                          00 MASSACHUSETTS
                                                                          NORTHEAST #01<
                                                                          NARRAGANSET BAY#06<  MOUNT HOPE BAY
                                                                          1111REGI              2111204
                                                                          2                    0000 FEET  DEPTH

                           00010       00300       00310       31501      31616
  DATE     TIME DEPTH     WATER         DO         BOD       TOT COLI   FEC COLI
  FROM      OF            TEMP                    5 DAY      MFIMENDO   MFM-FCBR
   TO      DAY  FEET      CENT         MG/L        MG/L       /100ML     /100ML

00/00/00
STATION   MAXIMUM          23.5         4.2         4.0      150000         40
          MINIMUM          20.5         3.1         1.0        5600         10
          MEAN             22.0         3.7         2.5       36200         26
99/99/99

                           00403       00080       00070       00500      00505       00530       00535       00410
  DATE     TIME DEPTH      LAB         COLOR       TURB       RESIDUE    RESIDUE     RESIDUE     RESIDUE     T ALK
  FROM      OF             PH          PT-CO       JKSN        TOTAL     TOT VOL     TOT NFLT    VOL NFLT    CACO3
   TO      DAY  FEET       SU          UNITS        JU         MG/L        MG/L        MG/L        MG/L       MG/L

00/00/00
STATION   MAXIMUM           7.0          140        14.0         207         91          36          11          24
          MINIMUM           6.6          100         1.5         130         41          16           8          19
          MEAN              6.8          114         5.8         161         56          25           9          22
99/99/99

                           60050       32230       00665       00625      00610       00615       00630
  DATE     TIME DEPTH     ALGAE       CHLRPHYL    PHOS-T     TOT KJEL    AMMONIA     NITRITE     NO2&NO3
  FROM      OF            TOTAL          A        P-WET         N        NH3-N       NO2-N         N
   TO      DAY  FEET       /ML         MG/L        MG/L        MG/L        MG/L        MG/L        MG/L

00/00/00
STATION   MAXIMUM          1472         4.8        4.92        4.20        4.28                    1.36
          MINIMUM          1472         1.5        4.00        1.40        1.64                    0.56
          MEAN             1472         3.1        4.47        2.94        2.95                    0.92
99/99/99

                           74010       01032       00720       71900
  DATE     TIME DEPTH      IRON       CHROMIUM    CYANIDE     MERCURY
  FROM      OF              FE        HEX-VAL       CN        HG,TOTAL
   TO      DAY  FEET       MG/L        UG/L        MG/L        UG/L

00/00/00
STATION   MAXIMUM           2.2        0.20
          MINIMUM           1.7        0.20
          MEAN              2.0        0.20
99/99/99
```

```
STORET RETRIEVAL DATE 71/11/11

                                                                          TR28
                                                                         41 54 27.0 070 54 56.0
                                                                         TAUNTON RIVER BASIN
                                                                         00 MASSACHUSETTS
                                                                         NORTHEAST #01<
                                                                         NARRAGANSETT BAY#06<  MOUNT HOPE BAY
                                                                         1111REG1                2111204
                                                                         2                     0000 FEET  DEPTH

                            00010      00300      00410      31501      31616
  DATE     TIME DEPTH      WATER        DO         BOD      TOT COLI   FEC COLI
  FROM      OF             TEMP                   5 DAY     MFIMENDO   MFM-FCBR
   TO      DAY   FEET      CENT        MG/L       MG/L      /100ML     /100ML

00/00/00
STATION  MAXIMUM            23.5        7.4        2.0      15000         60
         MINIMUM            20.5        5.8        0.0       3000         10
         MEAN               21.7        6.5        1.0       8620         41
99/99/99


                            00403      00080      00070      00500      00505      00530      00535      00410
  DATE     TIME DEPTH      LAB        COLOR      TURB      RESIDUE    RESIDUE    RESIDUE    RESIDUE    T ALK
  FROM      OF              PH        PT-CO      JKSN       TOTAL     TOT VOL    TOT NFLT   VOL NFLT   CACO3
   TO      DAY   FEET       SU        UNITS       JU        MG/L       MG/L       MG/L       MG/L      MG/L

00/00/00
STATION  MAXIMUM             6.5        70         1.9        106         55         15         12          9
         MINIMUM             6.2        50         1.2         72         24          2          2          6
         MEAN                6.4        59         1.6         83         38         10          6          7
99/99/99


                            60050      32210      00665      00625      00610      00615      00630
  DATE     TIME DEPTH      ALGAE     CHLRPHYL    PHOS-T    TOT KJEL   AMMONIA    NITRITE    NO2&NO3
  FROM      OF             TOTAL        A        P-WET        N        NH3-N      NO2-N        N
   TO      DAY   FEET       /ML        MG/L       MG/L       MG/L       MG/L       MG/L       MG/L

00/00/00
STATION  MAXIMUM            1358        1.6        1.40       1.20       0.24                  1.04
         MINIMUM            1358        0.4        0.24       0.10       0.02                  0.12
         MEAN               1358        1.0        0.50       0.60       0.13                  0.54
99/99/99


                            74010      01032      00720      71900
  DATE     TIME DEPTH      IRON      CHROMIUM   CYANIDE    MERCURY
  FROM      OF              FE       HEX-VAL      CN       HG,TOTAL
   TO      DAY   FEET      MG/L        UG/L       MG/L       UG/L

00/00/00
STATION  MAXIMUM             1.0        0.20
         MINIMUM             0.5        0.20
         MEAN                0.8        0.20
99/99/99
```

```
STORET RETRIEVAL DATE 77/11/21
                                                                   1M24
                                                                   41 56 02.0 070 56 24.0
                                                                   TAUNTON RIVER BASIN
                                                                   06 MASSACHUSETTS
                                                                   NORTHEAST 010
                                                                   NARRAGANSETT HARBORS  MOUNT HOPE BAY
                                                                   11113EPI             2111204
                                                                   2                    0000 FEET  DEPTH

                               00010     00300     00310     31501     31616
   DATE    TIME DEPTH WATER    DO        BOD       TOT COLI  FEC COLI
   FROM     OF        TEMP               5 DAY     MFIMENDO  MFM-FCBR
    TO     DAY  FEET  CENT     MG/L      MG/L      /100ML    /100ML

00/00/00
STATION  MAXIMUM       24.[illegible]  [illegible].1  [illegible]  11000     1000
         MINIMUM       21.0      0.6       1.0       4000      14
         MEAN          22.[illegible]  1.[illegible]  1.5  8000  22[illegible]
99/99/99

                               00400     00095     00480     00500     00505     00530     00535     00410
   DATE    TIME DEPTH PH       CNDUCTVY  SALINITY  RESIDUE   RESIDUE   RESIDUE   RESIDUE   T ALK
   FROM     OF                 AT 25C    PPTH      TOTAL     TOT VOL   TOT NFLT  VOL NFLT  CACO3
    TO     DAY  FEET  SU       MICROMHO            MG/L      MG/L      MG/L      MG/L      MG/L

00/00/00
STATION  MAXIMUM       8.5       70        1.7       107       44        10        6         14
         MINIMUM       8.1       50        1.1       76        27        1         1         10
         MEAN          8.3       60        1.4       88        35        6         4         12
99/99/99

                               00060     32210     00665     00625     00610     00615     00630
   DATE    TIME DEPTH ALGAE    CHLRPHYL  PHOS-T    TOT KJEL  AMMONIA   NITRITE   NO2&NO3
   FROM     OF        TOTAL    A         P-WET     N         NH3-N     NO2-N     N
    TO     DAY  FEET  [illegible]  UG/L  MG/L      MG/L      MG/L      MG/L      MG/L

00/00/00
STATION  MAXIMUM       1924      1.1       1.88      4.00      1.20                0.44
         MINIMUM       1926      0.4       1.48      0.50      0.09                0.50
         MEAN          1924      0.7       1.6       2.51      0.48                0.4[illegible]
99/99/99

                               74010     01032     00720     71900
   DATE    TIME DEPTH IRON     CHROMIUM  CYANIDE   MERCURY
   FROM     OF        FE       HEX-VAL   CN        HG-TOTAL
    TO     DAY  FEET  MG/L     UG/L      MG/L      UG/L

00/00/00
STATION  MAXIMUM       1.1       0.20
         MINIMUM       0.6       0.20
         MEAN          0.8       0.20
99/99/99
```

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STORET RETRIEVAL DATE 71/11/11
                                                                          TR30
                                                                         41 56 09.0 070 56 34.0
                                                                         TAUNTON RIVER BASIN
                                                                         00 MASSACHUSETTS
                                                                         NORTHEAST 601<
                                                                         NARRAGANSETT BAY#06<  MOUNT HOPE BAY
                                                                         1111REG1              2111204
                                                                         2                    0000 FEET  DEPTH

   DATE    TIME DEPTH   00010      00300      00310      31501      31616
   FROM     OF          WATER       DO        BOD       TOT COLI   FEC COLI
    TO     DAY  FEET    TEMP                 5 DAY      MFIMENDO   MFM-FCBR
                        CENT       MG/L       MG/L       /100ML     /100ML
 00/00/00
 STATION  MAXIMUM        23.0        2.9        1.0      12000         34
          MINIMUM        21.0        1.2        0.0       3000         12
          MEAN           22.2        1.8        0.8       7040         22
 99/99/99

   DATE    TIME DEPTH   00403      00080      00070      00500      00505      00540      00535      00410
   FROM     OF          LAB        COLOR      TURB       RESIDUE    RESIDUE    RESIDUE    RESIDUE    T ALK
    TO     DAY  FEET    PH         PT-CO      JKSN       TOTAL      TOT VOL    TOT NFLT   VOL NFLT   CACO3
                        SU         UNITS       JU        MG/L       MG/L       MG/L       MG/L       MG/L
 00/00/00
 STATION  MAXIMUM         6.5         65        1.4        108         55         17         16         12
          MINIMUM         6.2         50        0.9         79         26          1          1         10
          MEAN            6.3         59        1.2         87         36          9          8         11
 99/99/99

   DATE    TIME DEPTH   60050      32230      00665      00625      00610      00615      00630
   FROM     OF          ALGAE      CHLRPHYL   PHOS-T     TOT KJEL   AMMONIA    NITRITE    NO2&NO3
    TO     DAY  FEET    TOTAL        A        P-WET        N        NH3-N      NO2-N         N
                        /ML        MG/L       MG/L       MG/L       MG/L       MG/L       MG/L
 00/00/00
 STATION  MAXIMUM         736        1.1       1.68       3.40       0.24                  1.08
          MINIMUM         736        0.4       1.32       0.30       0.02                  0.32
          MEAN            736        0.6       1.43       1.00       0.10                  0.74
 99/99/99

   DATE    TIME DEPTH   74010      01032      00720      71900
   FROM     OF          IRON       CHROMIUM   CYANIDE    MERCURY
    TO     DAY  FEET    FE         HEX-VAL     CN        HG.TOTAL
                        MG/L       UG/L       MG/L       UG/L
 00/00/00
 STATION  MAXIMUM         1.0       0.20
          MINIMUM         0.6       0.20
          MEAN            0.8       0.20
 99/99/99
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STORET RETRIEVAL DATE 71/11/11
                                                                      TR31
                                                                      41 56 04.0 070 57 18.0
                                                                      TAUNTON RIVER BASIN
                                                                      00 MASSACHUSETTS
                                                                      NORTHEAST #01<
                                                                      NARRAGANSET BAY#06<  MOUNT HOPE BAY
                                                                      1111REG1             2111204
                                                                      2                    0000 FEET  DEPTH

                          00010     00300     00310     31501     31616
  DATE    TIME DEPTH    WATER       DO       BOD      TOT COLI  FEC COLI
  FROM     OF           TEMP                5 DAY     MFIMENDO  MFM-FCHR
   TO     DAY   FEET    CENT       MG/L      MG/L     /100ML    /100ML

00/00/00
STATION  MAXIMUM          26.5       5.1       8.0    110000        66
         MINIMUM          20.5       1.9       1.0      2000        10
         MEAN             23.2       3.8       2.1     42800        34
99/99/99

                          00403     00080     00070     00500     00505     00530     00535     00410
  DATE    TIME DEPTH    LAB        COLOR      TURB     RESIDUE   RESIDUE   RESIDUE   RESIDUE   T ALK
  FROM     OF            PH        PT-CO      JKSN      TOTAL    TOT VOL   TOT NFLT  VOL NFLT  CACO3
   TO     DAY   FEET     SU        UNITS       JU       MG/L      MG/L      MG/L      MG/L      MG/L

00/00/00
STATION  MAXIMUM           6.8       110      13.0       222        84        32        16        77
         MINIMUM           5.7        45       1.5       116        43         2         0        17
         MEAN              6.4        92       5.2       152        54        18         6        26
99/99/99

                          60050     32230     00665     00625     00610     00615     00630
  DATE    TIME DEPTH    ALGAE     CHLRPHYL   PHOS-T    TOT KJEL  AMMONIA   NITRITE   NO2&NO3
  FROM     OF           TOTAL        A       P-WET        N      NH3-N     NO2-N        N
   TO     DAY   FEET     /ML       MG/L      MG/L       MG/L      MG/L      MG/L      MG/L

00/00/00
STATION  MAXIMUM          3798       4.0      3.68      3.20      2.32                2.04
         MINIMUM          3673       1.6      0.52      0.90      0.09                0.44
         MEAN             3733       2.8      2.57      2.45      1.44                1.04
99/99/99

                          74010     01032     00720     71900
  DATE    TIME DEPTH    IRON      CHROMIUM   CYANIDE   MERCURY
  FROM     OF            FE       HEX-VAL      CN      HG,TOTAL
   TO     DAY   FEET    MG/L       UG/L       MG/L      UG/L

00/00/00
STATION  MAXIMUM           1.9      0.20
         MINIMUM           1.4      0.20
         MEAN              1.6      0.20
99/99/99
```

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STORET RETRIEVAL DATE 71/11/11
                                                                  TR32
                                                                  41 55 57.0 070 59 38.0
                                                                  TAUNTON RIVER BASIN
                                                                  25 MASSACHUSETTS
                                                                  NORTHEAST (01)
                                                                  NARRAGANSET BAY(06)  MOUNT HOPE BAY
                                                                  1111REGI             2111240
                                                                  2                   0000 FEET  DEPTH

                         00010     00300     00310     31501     31616
 DATE   TIME DEPTH      WATER       DO       BOD     TOT COLI  FEC COLI
 FROM    OF              TEMP                5 DAY   MFIMENDO  MFM-FCBR
  TO    DAY   FEET       CENT       MG/L      MG/L    /100ML    /100ML

00/00/00
STATION  MAXIMUM          26.0       4.4       5.0    220000      2500
         MINIMUM          22.0       2.4       1.0      7100       140
         MEAN             23.9       3.3       1.9     66420       996
99/99/99

                         00403     00080     00070     00500     00505     00530     00535     00410
 DATE   TIME DEPTH       LAB       COLOR      TURB    RESIDUE   RESIDUE   RESIDUE   RESIDUE    T ALK
 FROM    OF               PH       PT-CO      JKSN     TOTAL    TOT VOL   TOT NFLT  VOL NFLT   CACO3
  TO    DAY   FEET        SU       UNITS       JU       MG/L      MG/L      MG/L      MG/L      MG/L

00/00/00
STATION  MAXIMUM           6.2       120       5.2       129        46        17        10        21
         MINIMUM           5.9        50       3.7       109        23         5         2        15
         MEAN              6.1        93       4.3       119        37        12         5        19
99/99/99

                         60050     32230     00665     00625     00610     00615     00630
 DATE   TIME DEPTH      ALGAE    CHLRPHYL   PHOS-T   TOT KJEL  AMMONIA   NITRITE   NO2&NO3
 FROM    OF             TOTAL        A      P-WET        N      NH3-N     NO2-N       N
  TO    DAY   FEET       /ML       MG/L      MG/L      MG/L      MG/L      MG/L      MG/L

00/00/00
STATION  MAXIMUM          4585       6.4      3.84      2.90      1.96                1.72
         MINIMUM          4585       1.6      0.80      1.80      0.09                1.32
         MEAN             4585       4.4      2.33      2.33      0.87                1.49
99/99/99
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STORET RETRIEVAL DATE 71/11/11
                                                                         TR33
                                                                        41 54 10.0 070 59 48.0
                                                                        TAUNTON RIVER BASIN
                                                                        00 MASSACHUSETTS
                                                                        NORTHEAST *01<
                                                                        NARRAGANSET BAY*06<  MOUNT HOPE BAY
                                                                        1111REG1              2111204
                                                                        2                     0000 FEET  DEPTH

                              00010     00300     00310     31501     31616
  DATE     TIME DEPTH    WATER       DO        BOD    TOT COLI  FEC COLI
  FROM      OF            TEMP                5 DAY   MFIMENDO  MFM-FCBR
   TO      DAY   FEET     CENT       MG/L      MG/L    /100ML    /100ML

00/00/00
STATION   MAXIMUM          25.5       4.9       3.0     28000       270
          MINIMUM          22.0       3.1       1.0     10000       126
          MEAN             23.4       4.1       1.6     14400       183
99/99/99

                              00403     00080     00070     00500     00505     00530     00535     00410
  DATE     TIME DEPTH      LAB       COLOR      TURB    RESIDUE   RESIDUE   RESIDUE   RESIDUE    T ALK
  FROM      OF              PH       PT-CO     JKSN      TOTAL    TOT VOL   TOT NFLT  VOL NFLT   CACO3
   TO      DAY   FEET       SU       UNITS      JU        MG/L      MG/L      MG/L      MG/L      MG/L

00/00/00
STATION   MAXIMUM           6.4        119       4.1       196       117        11         6        17
          MINIMUM           5.1         55       3.7       109        15         6         4         2
          MEAN              5.9         82  [illegible]    149        62         9         5        12
99/99/99

                              60050     32230     00665     00625     00610     00615     00630
  DATE     TIME DEPTH     ALGAE     CHLRPHYL   PHOS-T   TOT KJEL  AMMONIA   NITRITE   NO2&NO3
  FROM      OF            TOTAL         A      P-WET        N      NH3-N     NO2-N        N
   TO      DAY   FEET      /ML        MG/L      MG/L      MG/L      MG/L      MG/L      MG/L

00/00/00
STATION   MAXIMUM          6224        8.0      5.80      2.80      1.30                2.48
          MINIMUM          6224        5.2      1.20      1.40      0.12                1.00
          MEAN             6224        7.1      3.03      2.14      0.77                1.43
99/99/99
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STORET RETRIEVAL DATE 71/11/11
                                                                      TR34
                                                                      41 53 09.0 071 41 51.0
                                                                      TAUNTON RIVER BASIN
                                                                      00 MASSACHUSETTS
                                                                      NORTHEAST *01<
                                                                      NARRAGANSET BAY*06<  MOUNT HOPE BAY
                                                                      1111REG1             2111204
                                                                      2                    0000 FEET  DEPTH

                         00010      00300      00310      31501      31616
  DATE    TIME DEPTH     WATER       DO         BOD      TOT COLI   FEC COLI
  FROM     OF            TEMP                  5 DAY     MFIMENDO   MFM-FCBR
   TO     DAY   FEET     CENT       MG/L       MG/L      /100ML     /100ML

00/00/00
STATION  MAXIMUM           25.5        3.4       12.0      34000        150
         MINIMUM           21.5        1.9        1.0      10000         34
         MEAN              23.9        2.5        2.9      22400         74
99/99/99

                         00403      00080      00070      00500      00505      00530      00535      00410
  DATE    TIME DEPTH      LAB       COLOR      TURB      RESIDUE    RESIDUE    RESIDUE    RESIDUE     T ALK
  FROM     OF              PH       PT-CO      JKSN       TOTAL     TOT VOL    TOT NFLT   VOL NFLT    CACO3
   TO     DAY   FEET       SU       UNITS       JU        MG/L       MG/L       MG/L       MG/L       MG/L

00/00/00
STATION  MAXIMUM            6.4         85        4.7        150         61          6          4         24
         MINIMUM            6.0         50        3.9        112         52          2          2         10
         MEAN               6.2         70        4.3        130         57          4          3         15
99/99/99

                         60050      32230      00665      00625      00610      00615      00630
  DATE    TIME DEPTH     ALGAE     CHLRPHYL    PHOS-T    TOT KJEL   AMMONIA    NITRITE    NO2&NO3
  FROM     OF            TOTAL        A        P-WET        N        NH3-N      NO2-N        N
   TO     DAY   FEET      /ML        MG/L       MG/L       MG/L       MG/L       MG/L       MG/L

00/00/00
STATION  MAXIMUM           5137        3.6       3.52       2.50       0.14                  7.20
         MINIMUM           5137        1.6       0.70       0.90       0.10                  1.16
         MEAN              5137        2.7       1.85       1.74       0.11                  3.26
99/99/99
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STORET RETRIEVAL DATE 71/11/11
                                                                          TR36
                                                                          41 54 17.0 071 03 39.0
                                                                          TAUNTON RIVER BASIN
                                                                          00 MASSACHUSETTS
                                                                          NORTHEAST (01)
                                                                          NARRAGANASET BAY (06) MOUNTHOPE BAY
                                                                          11111REGI            2141104
                                                                          2                    0000 FEET  DEPTH

                             00010      00300      00310      31501      31616
  DATE    TIME  DEPTH        WATER       DO         BOD      TOT COLI   FEC COLI
  FROM     OF                TEMP                  5 DAY     MFIMENDO   MFM-FCBR
   TO     DAY   FEET         CENT       MG/L       MG/L       /100ML     /100ML

00/00/00
STATION   MAXIMUM            22.0        9.1        6.0       49000       1800
          MINIMUM            17.5        6.7        1.0       13000        580
          MEAN               20.3        7.5        1.5       33800       1336
99/99/99

                             00403      00080      00070      00500      00505      00530      00535      00410
  DATE    TIME  DEPTH        LAB        COLOR      TURB      RESIDUE    RESIDUE    RESIDUE    RESIDUE    T ALK
  FROM     OF                PH         PT-CO      JKSN       TOTAL     TOT VOL    TOT NFLT   VOL NFLT   CACO3
   TO     DAY   FEET         SU         UNITS      JTU        MG/L       MG/L       MG/L       MG/L       MG/L

00/00/00
STATION   MAXIMUM            6.5         170        6.2        123         81         19         12         16
          MINIMUM            6.1         150        5.2         90         44          4          4          9
          MEAN               6.3         160        5.7        109         60         12          8         12
99/99/99

                             60050      32230      00665      00625      00610      00615      00630
  DATE    TIME  DEPTH        ALGAE     CHLRPHYL    PHOS-T    TOT KJEL   AMMONIA    NITRITE    NO2&NO3
  FROM     OF                TOTAL        A        P-WET        N        NH3-N      NO2-N        N
   TO     DAY   FEET          /ML        MG/L       MG/L       MG/L       MG/L       MG/L       MG/L

00/00/00
STATION   MAXIMUM            4302        3.6       0.88       2.50       1.22                  1.92
          MINIMUM            4302        2.0       0.08       1.00       0.08                  1.04
          MEAN               4302        2.5       0.43       1.68       0.58                  1.41
99/99/99
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STORET RETRIEVAL DATE 71/11/11

                                                                              1R39
                                                                             41 53 46.0 071 05 08.0
                                                                             TAUNTON RIVER BASIN
                                                                             00 MASSACHUSETTS
                                                                             NORTHEAST *01<
                                                                             NARRAGANSET BAY*06<  MOUNT HOPE BAY
                                                                             1111REG1                 2141104
                                                                             2                       0002 FEET  DEPTH

                               00010      00300      00310      31501      31616
  DATE     TIME DEPTH          WATER       DO        BOD       TOT COLI   FEC COLI
  FROM      OF                 TEMP                  5 DAY     MFIMENDO   MFM-FCBR
   TO      DAY   FEET          CENT       MG/L       MG/L      /100ML     /100ML

00/00/00
STATION   MAXIMUM              25.0        4.8        3.0     460000      15000
          MINIMUM              21.5        2.7        1.0      27000       3000
          MEAN                 23.3        3.8        2.0     205000       8180
99/99/99

                               00403      00080      00070      00500      00505      00530      00535      00410
  DATE     TIME DEPTH          LAB        COLOR      TURB      RESIDUE    RESIDUE    RESIDUE    RESIDUE      T ALK
  FROM      OF                 PH         PT-CO      JKSN       TOTAL     TOT VOL    TOT NFLT   VOL NFLT     CACO3
   TO      DAY   FEET          SU         UNITS       JU        MG/L       MG/L       MG/L       MG/L        MG/L

00/00/00
STATION   MAXIMUM               6.2         90        2.6        121         40          9          7          12
          MINIMUM               6.1         70        2.5        107         31          7          3          10
          MEAN                  6.2         80        2.6        114         36          8          5          11
99/99/99

                               60050      32230      00665      00625      00610      00615      00630
  DATE     TIME DEPTH          ALGAE     CHLRPHYL    PHOS-T    TOT KJEL   AMMONIA    NITRITE    NO2&NO3
  FROM      OF                 TOTAL        A        P-WET        N       NH3-N      NO2-N         N
   TO      DAY   FEET          /ML        MG/L       MG/L       MG/L       MG/L       MG/L       MG/L

00/00/00
STATION   MAXIMUM              3226        1.6       0.92       2.00       0.76                  1.04
          MINIMUM              3226        0.8       0.34       0.60       0.10                  0.60
          MEAN                 3226        1.4       0.72       1.33       0.37                  0.80
99/99/99
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TAUNTON RIVER SURVEY

Parameters - (Units of Measure)

Temp. - Temperature (Degrees Centigrade, °C)

D.O. - Dissolved Oxygen (milligrams/liter, mg/l)

pH - (Standard Units)

Color - (Platinum - Cobalt Units)

Turbidity - Jackson Candle (Jackson Units)

BOD_5 - Biochemical Oxygen Demand, 5-day at 20°C (mg/l)

Total Coliform, Membrane Filter Method, Immediate M-Endo Medium (number per 100 milliliters, ml)

Fecal Coliform - Membrane Filter Method, MF-C Broth at 44.5°C (number per 100 ml)

Total Residue - (mg/l)

Total Vol. Residue - Total Volatile Residue (mg/l)

Total Nfilt. Residue - (Total Non-filterable Residue (mg/l)

Total Vol. Nfilt. - Total Volatile Non-filterable Residue (mg/l)

Total Alk. $CaCO_3$ - Total Alkalinity Measured as Calcium Carbonate (mg/l)

Conductivity (Micromhos at 25° C)

Salinity (parts per 1000 parts)

Total Kjel - Total Nitrogen, Kjeldahl Method (mg/l as nitrogen)

Ammonia, NH_3 - N, recorded as nitrogen (mg/l)

NO_2 and NO_3 - N, combined nitrite and nitrate recorded as nitrogen (mg/l)

Total Phos. P-wet - Total phosphorus recorded as phosphorus, wet method (mg/l)

Chlorophyll - Chlorophyl A (milligrams per cubic meters)

TAUNTON RIVER BASIN

Data Summary Sheet for Tidal Stations
Station TR 35
July 24, 27-30, 1970

Tide	Water Temp. °C	DO	pH	Color	Tur-bidity	BOD_5	Coliforms		Residue			
							Total	Fecal	Total	Total Vol.	Total Nfilt.	Total Vol. Nfilt.
High												
Max.	27.0	8.5	6.9	85	23	2.0	15,000	490	198	76	12	11
Min.	22.5	4.5	3.4	45	9	1.0	13,000	240	130	49	11	6
Ave.	25.1	6.3	5.9	72	13	1.4	14,000	365	167	65	11	9
Low												
Max.	28.0	6.7	6.8	90	12	2.0	41,000	670	220	88	8	7
Min.	22.0	3.4	6.2	45	6	1.0	16,000	180	119	45	3	1
Ave.	25.3	5.2	6.4	71	10	1.5	31,000	450	167	67	6	3

Tide	Total Alk. $CaCO_3$	Conductivity	Salinity	Total Kjel.	Ammonia NH_3 - N	NO_2 & NO_3 -N-	Total Phos. P - Wet	Chlor-ophyll
High								
Max.				2.3	0.26	2.84	5.08	5.6
Min.				0.7	0.04	2.08	0.98	2.8
Ave.				1.1	0.15	2.52	2.65	3.9
Low								
Max.				3.0	1.04	3.28	3.36	5.2
Min.				0.7	0.09	1.60	0.78	4.0
Ave.				1.4	0.41	2.16	1.86	4.7

TAUNTON RIVER BASIN

Data Summary Sheet for Tidal Stations
Station 37
July 24, 27-28, 1970

Tide	Water Temp. °C	DO	pH	Color	Turbidity	BOD_5	Coliforms		Residue			
							Total	Fecal	Total	Total Vol.	Total Nfilt.	Total Vol. Nfilt.
High												
Max.	28.0	7.3	6.7	85	3.0	3.0	420,000	3,000	160	63	64	16
Min.	22.0	4.1	3.2	75	1.2	1.0	17,000	90	113	53	9	8
Ave.	25.3	5.7	5.7	79	2.3	1.8	118,000	1,150	143	58	26	11
Low												
Max.	27.5	7.2	6.6	90	4.1	5.0	39,000	370	216	123	15	9
Min.	22.0	4.6	5.8	50	1.3	1.0	8,700	90	107	51	8	2
Ave.	25.6	5.7	6.2	72	2.7	1.5	20,700	190	155	82	12	6

Tide	Total Alk. $CaCO_3$	Conductivity	Salinity	Total Kjel.	Ammonia $NH_3 - N$	NO_2 & NO_3 -N-	Total Phos. P - Wet	Chlorophyll
High								
Max.				2.9	0.420	2.40	2.92	7.2
Min.				1.0	0.090	1.36	1.08	2.4
Ave.				1.7	0.192	1.92	1.86	4.6
Low								
Max.				3.0	0.140	3.52	3.12	6.0
Min.				0.7	0.040	1.20	0.88	1.6
Ave.				1.5	0.090	2.02	1.80	3.7

TAUNTON RIVER BASIN

Data Summary Sheet for Tidal Stations
Station 39
July 24, 27-30, 1970

Tide	Water Temp. °C	DO	pH	Color	Turbidity	BOD_5	Coliforms		Residue			
							Total	Fecal	Total	Total Vol.	Total Nfilt.	Total Vol. Nfilt.
High												
Max.	31.0	7.5	7.6	85	4.0	8.0	930,000	730,000	393	94	34	22
Min.	26.0	0.3	5.7	65	1.0	3.0	28,000	890	242	44	27	13
Ave.	28.5	3.7	6.5	75	2.8	5.8	385,000	153,000	287	69	31	19
Low												
Max.	29.3	6.0	6.6	85	3.2	6.0	200,000	3,500	245	76	18	15
Min.	24.0	2.0	6.2	70	1.3	2.0	30,000	1,000	151	49	12	6
Ave.	27.3	3.4	6.3	75	2.3	3.4	106,000	1,700	180	62	14	10

Tide	Total Alk. $CaCO_3$	Conductivity	Salinity	Total Kjel.	Ammonia NH_3 - N	NO_2 & NO_3 -N-	Total Phos. P - Wet	Chlorophyll
High								
Max.		1.0	0.4	3.0	1.04	2.24	3.84	12.8
Min.		0.5	0.2	0.4	0.08	0.34	1.40	4.8
Ave.		0.9	0.3	1.9	0.54	1.51	2.96	8.4
Low								
Max.		0.5	0.3	2.4	1.22	2.32	3.00	8.4
Min.		0.0	0.0	1.0	0.44	1.28	1.24	3.2
Ave.		0.3	0.2	1.4	0.93	1.65	1.87	5.4

TAUNTON RIVER BASIN

Data Summary Sheet for Tidal Stations

Station 40

July 24, 27-30, 1970

Tide	Water Temp. °C	DO	pH	Color	Tur-bidity	BOD_5	Coliforms		Residue			
							Total	Fecal	Total	Total Vol.	Total Nfilt.	Total Vol. Nfilt.
High												
Max.	29.2	10.0	7.2	60	3.6	6.0	780,000	30,000	7,800	1,720	32	28
Min.	24.5	2.2	4.8	35	0.5	2.0	28,000	110	3,540	680	26	13
Ave.	27.2	5.6	4.8	50	2.0	4.2	382,000	10,600	4,680	1,090	29	20
Low												
Max.	31.5	4.6	6.7	80	3.4	6.0	210,000	8,700	244	66	22	12
Min.	25.0	0.6	6.2	60	1.1	3.0	3,700	200	152	44	16	9
Ave.	28.6	1.9	6.4	70	2.4	5.1	73,700	2,500	211	57	19	10

Tide	Total Alk. $CaCO_3$	Conductivity	Salinity	Total Kjel.	Ammonia NH_3 - N	NO_2 & NO_3 -N-	Total Phos. P - Wet	Chlor-ophyll
High								
Max.		28.0	9.3	2.8	0.84	2.24	2.24	16.0
Min.		8.0	4.4	1.1	0.10	1.00	0.96	8.4
Ave.		14.3	6.5	1.8	0.44	1.38	1.57	13.0
Low								
Max.		1.0	0.4	4.0	0.76	2.40	2.52	12.4
Min.		0.2	0.1	1.9	0.06	1.08	1.12	5.2
Ave.		0.8	0.3	2.8	0.41	1.56	1.74	7.0

TAUNTON RIVER BASIN

Data Summary Sheet for Tidal Stations

Station 41
July 24, 27-30, 1970

Tide	Water Temp. °C	DO	pH	Color	Tur-bidity	BOD_5	Coliforms		Residue			
							Total	Fecal	Total	Total Vol.	Total Nfilt.	Total Vol. Nfilt.
High												
Max.	28.6	9.4	8.0	50	2.3	8.0	63,000	3,000	17,400	6,350	37	30
Min.	23.0	4.9	4.8	30	0.5	2.0	6,900	40	14,600	3,210	25	10
Ave.	26.3	6.7	6.8	40	1.5	4.0	27,800	980	15,850	4,177	31	19
Low												
Max.	30.1	6.4	7.0	90	4.3	8.0	1,190,000	33,000	754	274	38	24
Min.	24.0	1.5	6.6	60	0.6	5.0	34,000	100	113	102	26	14
Ave.	27.6	4.2	6.8	70	2.5	6.1	432,000	13,500	565	180	33	17

Tide	Total Alk. $CaCO_3$	Conductivity	Salinity	Total Kjel.	Ammonia NH_3 - N	NO_2 & NO_3 -N-	Total Phos. P - Wet	Chlor-ophyll
High								
Max.		26	14.9	1.4	0.56	0.96	10.00	7.2
Min.		24	14.1	1.0	0.07	0.32	0.76	3.2
Ave.		25	14.5	1.1	0.27	0.57	3.35	5.6
Low								
Max.		1	0.6	2.2	0.44	2.12	3.84	29.2
Min.		1	0.4	1.4	0.18	0.92	0.88	9.2
Ave.		1	0.5	1.9	0.30	1.36	1.88	18.3

TAUNTON RIVER BASIN

Data Summary Sheet for Tidal Stations
Station 42
July 24, 27-30, 1970

Tide		Water Temp. °C	DO	pH	Color	Tur-bidity	BOD_5	Coliforms		Residue			
								Total	Fecal	Total	Total Vol.	Total Nfilt.	Total Vol. Nfilt.
High	Max.	29.1	11.0	7.6	50	3.1	9.0	43,000	500	16,900	6,060	30	25
	Min.	23.5	5.0	5.8	20	0.8	2.0	1,400	10	11,740	2,140	14	7
	Ave.	26.5	7.3	7.0	35	1.8	4.0	14,900	160	14,450	9,595	21	14
Low	Max.	29.0	7.0	7.2	60	2.4	4.0	300,000	5,000	6,820	2,200	27	18
	Min.	22.6	3.4	1.6	25	0.6	2.0	23,000	100	1,420	1,000	21	12
	Ave.	26.5	5.5	6.0	45	1.9	2.8	193,000	2,800	4,850	1,450	23	16

Tide		Total Alk. $CaCO_3$	Conductivity	Salinity	Total Kjel.	Ammonia NH_3 - N	NO_2 & NO_3 -N-	Total Phos. P - Wet	Chlor-ophyll
High	Max.		27.0	18.7	1.2	0.62	6.24	1.72	6.8
	Min.		21.0	12.1	0.6	0.12	0.36	0.60	4.0
	Ave.		24.3	15.0	0.9	0.39	2.19	1.00	5.8
Low	Max.		10.0	5.3	2.4	0.54	2.04	2.20	13.2
	Min.		8.0	4.5	0.6	0.32	1.04	0.64	6.4
	Ave.		8.7	4.9	1.1	0.43	1.38	1.23	9.4

TAUNTON RIVER BASIN

Data Summary Sheet for Tidal Stations

Station 42

August 3-7, 1970

Tide	Water Temp. °C	DO	pH	Color	Tur-bidity	BOD_5	Coliforms		Residue			
							Total	Fecal	Total	Total Vol.	Total Nfilt.	Total Vol. Nfilt.
High												
Max.	27.8	7.6	8.2	60	3.10	4.0	75,000	1,700	28,020	6,865	52	37
Min.	23.0	4.1	7.0	20	0.50	2.0	6,200	140	11,300	709	14	11
Ave.	25.8	5.9	7.6	40	2.10	2.9	41,100	670	18,970	4,501	36	22
Low												
Max.	28.7	4.9	8.2	55	3.60	4.0	320,000	2,800	55,990	2,220	35	28
Min.	25.0	2.2	6.8	30	0.55	3.0	200,000	1,300	5,245	1,265	4	3
Ave.	27.0	3.4	7.7	45	2.35	3.4	260,000	2,050	16,528	1,568	21	19

Tide	Total Alk. $CaCO_3$	Conductivity	Salinity	Total Kjel.	Ammonia $NH_3 - N$	NO_2 & NO_3 -N-	Total Phos. P - Wet	Chlor-ophyll
High								
Max.		36	22.3	1.80	0.62		0.76	11.2
Min.		24	14.2	0.80	0.38		0.45	3.6
Ave.		31	18.1	1.26	0.48		0.60	6.2
Low								
Max.		13	7.3	2.00	0.88		0.96	11.2
Min.		8	4.3	0.85	0.56		0.66	5.2
Ave.		11	6.0	1.39	0.69		0.84	7.2

TAUNTON RIVER BASIN

Data Summary Sheet for Tidal Stations

Station TR44
August 3-7, 1970

Tide	Water Temp. °C	DO	pH	Color	Tur-bidity	BOD_5	Coliforms		Residue			
							Total	Fecal	Total	Total Vol.	Total Nfilt.	Total Vol. Nfilt.
High												
Max.	26.9	7.3	8.4	40	1.80	5.0	1,900	150	30,030	9,835	57	30
Min.	23.9	4.6	7.4	20	0.35	1.0	70	2	24,000	1,130	11	8
Ave.	25.6	6.1	7.7	30	1.05	2.1	700	51	27,440	6,538	37	20
Low												
Max.	27.8	6.2	8.1	50	3.6	4.0	44,000	820	26,570	7,455	50	38
Min.	24.5	3.2	3.0	21	1.0	2.0	28,000	140	17,785	4,205	12	10
Ave.	26.3	4.8	6.7	35	2.5	2.7	36,670	380	21,772	5,780	32	25

Tide	Total Alk. $CaCO_3$	Conductivity	Salinity	Total Kjel.	Ammonia NH_3 - N	NO_2 & NO_3 -N-	Total Phos. P - Wet	Chlor-ophyll
High								
Max.		41	25.9	1.60	0.30		0.40	4.4
Min.		37	23.5	0.40	0.26		0.30	1.6
Ave.		39	24.3	1.05	0.29		0.34	2.9
Low								
Max.		35	21.7	2.00	0.60		0.66	10.0
Min.		28	16.4	0.80	0.30		0.41	4.8
Ave.		31	19.7	1.30	0.42		0.55	6.4

TAUNTON RIVER BASIN

Data Summary Sheet for Tidal Stations

Station TR 45
August 3-7, 1970

Tide	Water Temp. °C	DO	pH	Color	Tur-bidity	BOD_5	Coliforms		Residue			
							Total	Fecal	Total	Total Vol.	Total Nfilt.	Total Vol. Nfilt.
High												
Max.	27.2	7.0	8.4	25	1.0				44,350	18,405	69	30
Min.	24.5	4.8	7.7	13	0.5				23,530	5,760	11	6
Ave.	26.0	5.8	7.9	19	0.8				33,308	9,667	34	21
Low												
Max.	28.5	7.1	8.2	35	2.4				39,445	17,610	53	36
Min.	24.0	5.2	7.6	21	0.5				11,370	5,450	17	16
Ave.	26.6	6.0	7.9	26	1.4				27,467	9,050	31	24

Tide	Total Alk. $CaCO_3$	Conductivity	Salinity	Total Kjel.	Ammonia $NH_3 - N$	NO_2 & NO_3 -N-	Total Phos. P - Wet	Chlor-ophyll
High								
Max.		41	25.4					
Min.		38	23.0					
Ave.		39	24.1					
Low								
Max.		40	25.0					
Min.		37	22.1					
Ave.		38	23.5					

TAUNTON RIVER BASIN

Data Summary Sheet for Tidal Stations

Station TR 46
August 3-7, 1970

Tide	Water Temp. °C	DO	pH	Color	Tur-bidity	BOD_5	Coliforms		Residue			
							Total	Fecal	Total	Total Vol.	Total Nfilt.	Total Vol. Nfilt.
High												
Max.	26.6	7.3	8.6	25	1.5	4.0	1,500	150	51,225	29,020	71	32
Min.	24.5	4.8	7.8	15	0.6	2.0	110	2	26,740	6,385	12	1
Ave.	25.5	6.4	8.1	20	1.0	2.3	550	43	34,904	13,413	46	22
Low												
Max.	27.2	7.5	8.3	30	2.5	6.0	4,600	150	32,165	11,760	60	31
Min.	24.0	4.4	7.7	19	0.5	1.0	2,200	10	26,505	5,745	17	14
Ave.	25.9	6.0	7.9	24	1.4	2.6	2,980	75	29,877	8,138	38	24

Tide	Total Alk. $CaCO_3$	Conductivity	Salinity	Total Kjel.	Ammonia NH_3 - N	NO_2 & NO_3 -N-	Total Phos. P - Wet	Chlor-ophyll
High								
Max.		41	25.5	1.70	1.02		0.29	3.6
Min.		38	24.0	0.70	0.22		0.14	2.8
Ave.		39	24.6	1.25	0.44		0.25	3.1
Low								
Max.		41	25.9	2.50	0.48		0.40	7.6
Min.		37	22.9	0.70	0.32		0.29	3.2
Ave.		38	24.0	1.32	0.41		0.34	5.1

TAUNTON RIVER BASIN

Data Summary Sheet for Tidal Stations

Station 47
August 3-7, 1970

Tide	Water Temp. °C	DO	pH	Color	Tur- bidity	BOD_5	Coliforms		Residue			
							Total	Fecal	Total	Total Vol.	Total Nfilt.	Total Vol. Nfilt.
High												
Max.	26.4	6.6	8.5	25	2.5	2.0	1,300	44	47,230	20,570	74	29
Min.	23.3	3.9	7.9	6	1.0	1.0	100	10	29,600	6,080	7	7
Ave.	24.6	4.8	8.1	14	1.6	1.1	550	32	37,594	12,307	39	22
Low												
Max.	26.3	7.0	8.4	25	2.0	2.0	320	10	49,950	27,500	53	32
Min.	23.5	4.0	7.9	14	0.5	1.0	130	2	28,010	5,660	14	10
Ave.	25.0	5.2	8.0	19	1.2	1.1	237	6	36,554	12,637	37	20

Tide	Total Alk. $CaCO_3$	Conductivity	Salinity	Total Kjel.	Ammonia NH_3 - N	NO_2 & NO_3 -N-	Total Phos. P - Wet	Chlor- ophyll
High								
Max.		45	29.6	2.20	0.40		0.28	5.2
Min.		44	28.4	0.80	0.26		0.18	2.8
Ave.		45	29.3	1.40	0.30		0.23	3.6
Low								
Max.		43	28.0	2.00	0.32		0.32	11.6
Min.		41	26.3	0.70	0.20		0.25	2.4
Ave.		42	27.3	1.24	0.25		0.28	4.9

TAUNTON RIVER BASIN

Data Summary Sheet for Tidal Stations

Station 48

August 3-7, 1970

Tide	Water Temp. °C	DO	pH	Color	Tur-bidity	BOD_5	Coliforms		Residue			
							Total	Fecal	Total	Total Vol.	Total Nfilt.	Total Vol. Nfilt.
High												
Max.	26.2	8.3	8.6	20	1.50	7.0	4,100	430	37,325	11,975	70	40
Min.	24.0	5.6	8.0	12	0.65	1.0	270	10	29,400	6,805	12	11
Ave.	25.5	6.5	8.1	15	1.01	2.9	1,600	106	33,491	8,801	43	25
Low												
Max.	27.0	7.8	8.4	25	2.00	5.0	3,600	46	37,550	14,140	60	30
Min.	23.0	4.8	7.8	14	0.50	1.0	350	2	26,610	5,945	16	16
Ave.	25.4	6.2	8.0	19	1.06	2.3	1,540	24	31,434	8,396	35	23

Tide	Total Alk. $CaCO_3$	Conductivity	Salinity	Total Kjel.	Ammonia $NH_3 - N$	NO_2 & NO_3 -N-	Total Phos. P - Wet	Chlor-ophyll
High								
Max.		43	27.4	2.00	0.46		1.33	5.6
Min.		41	26.1	0.80	0.12		0.25	3.2
Ave.		43	27.0	1.34	0.24			4.2
Low								
Max.		42	26.6	1.60	0.76		0.32	7.6
Min.		41	25.4	0.80	0.28		0.23	2.8
Ave.		41	25.9	1.18	0.42		0.29	4.4

TAUNTON RIVER BASIN

Data Summary Sheet for Tidal Stations
Station 49

Tide	Water Temp. °C	DO	pH	Color	Tur-bidity	BOD_5	Coliforms Total	Coliforms Fecal	Residue Total	Residue Total Vol.	Residue Total Nfilt.	Residue Total Vol. Nfilt.
High												
Max.	25.3	6.4	8.5	20	2.80	2.0	8,700	370	41,905	15,400	69	30
Min.	23.0	4.0	7.9	7	1.10	0.0	100	10	31,400	7,020	11	9
Ave.	23.9	4.9	8.1	14	1.80	1.0	2,400	114	37,039	10,912	39	22
Low												
Max.	25.0	5.8	8.5	20	2.10	2.0	1,500	80	52,655	28,010	71	29
Min.	22.0	3.7	7.9	11	0.45	1.1	100	2	31,700	7,330	9	8
Ave.	23.7	4.7	8.1	16	1.49	1.0	700	31	40,866	15,452	41	22

Tide	Total Alk. $CaCO_3$	Conductivity	Salinity	Total Kjel.	Ammonia NH_3 - N	NO_2 & NO_3 -N-	Total Phos. P - Wet	Chlor-ophyll
High								
Max.		45	30.2	1.90	0.40		0.38	4.4
Min.		45	29.0	0.80	0.24		0.14	3.2
Ave.		45	29.7	1.34	0.35		0.29	3.8
Low								
Max.		45	29.9	2.40	0.56		0.28	4.4
Min.		44	28.7	0.75	0.22		0.21	1.2
Ave.		44	29.4	1.43	0.35		0.25	3.5

TAUNTON RIVER BASIN

Data Summary Sheet for Tidal Stations
Station 50

Tide	Water Temp. °C	DO	pH	Color	Tur-bidity	BOD_5	Coliforms		Residue			
							Total	Fecal	Total	Total Vol.	Total Nfilt.	Total Vol. Nfilt.
High												
Max.	26.5	7.2	8.1	20	1.70	6.0	25,000	460	38,880	13,860	77	33
Min.	23.5	5.3	8.1	11	0.65	2.0	270	20	32,675	6,705	7	4
Ave.	25.2	6.2	8.1	16	1.30	3.1	5,700	147	35,283	10,054	44	23
Low												
Max.	27.3	7.5	8.4	20	4.00	4.0	1,500	88	39,475	15,590	80	40
Min.	20.8	4.3	8.0	9	0.63	1.0	110	6	30,050	6,385	14	13
Ave.	25.0	6.0	8.1	15	1.60	2.4	520	25	36,021	11,800	45	25

Tide	Total Alk. $CaCO_3$	Conductivity	Salinity	Total Kjel.	Ammonia NH_3 - N	NO_2 & NO_3 -N-	Total Phos. P - Wet	Chlor-ophyll
High								
Max.		45	29.2	2.70	0.56		0.30	6.4
Min.		45	28.2	0.80	0.18		0.18	4.0
Ave.		45	28.7	1.46	0.34		0.24	4.9
Low								
Max.		44	28.1	2.20	0.48		0.26	12.0
Min.		43	26.7	0.75	0.18		0.19	3.2
Ave.		44	27.5	1.35	0.34		0.23	6.6

TAUNTON RIVER BASIN

Data Summary Sheet for Tidal Stations
Station 51

Tide	Water Temp. °C	DO	pH	Color	Tur-bidity	BOD_5	Coliforms		Residue			
							Total	Fecal	Total	Total Vol.	Total Nfilt.	Total Vol. Nfilt.
High												
Max.	24.5	6.8	8.2	15	3.50	2.0	5,300	230	46,735	21,140	86	35
Min.	21.0	4.1	8.0	6	1.80	1.0	40	2	29,500	7,870	11	8
Ave.	22.9	5.0	8.1	11	2.83	1.1	885	37	39,436	17,793	43	21
Low												
Max.	25.2	7.7	8.2	34	2.30	3.0	360	34	41,995	16,175	50	26
Min.	21.5	4.3	7.9	9	0.75	1.0	20	2	17,800	4,340	2	1
Ave.	23.3	5.1	8.1	18	1.47	1.2	191	15	34,524	11,209	31	16

Tide	Total Alk. $CaCO_3$	Conductivity	Salinity	Total Kjel.	Ammonia NH_3 - N	NO_2 & NO_3 -N-	Total Phos. P - Wet	Chlor-ophyll
High								
Max.		45	30.6	2.20	0.40		0.17	4.4
Min.		44	30.1	0.70	0.22		0.08	2.4
Ave.		45	30.3	1.44	0.34		0.13	3.4
Low								
Max.		46	30.8	2.20	0.56		0.61	4.4
Min.		44	29.6	0.60	0.12		0.18	2.4
Ave.		45	30.2	1.40	0.35		0.32	3.0

APPENDIX E

APPENDIX E

MODEL STUDY

BRAYTON POINT STATION
SOMERSET, MASSACHUSETTS

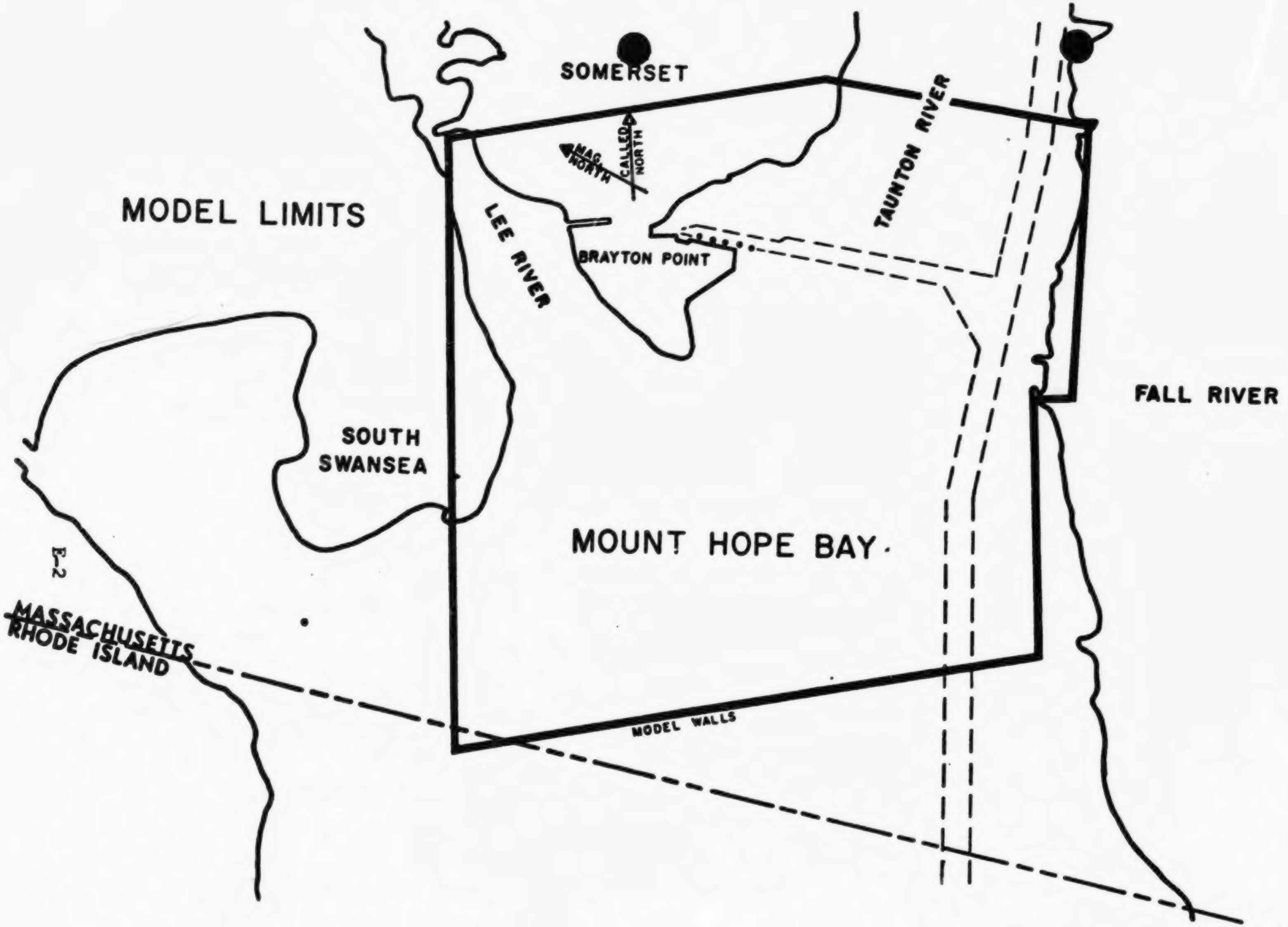
FOR

NEW ENGLAND POWER CO.

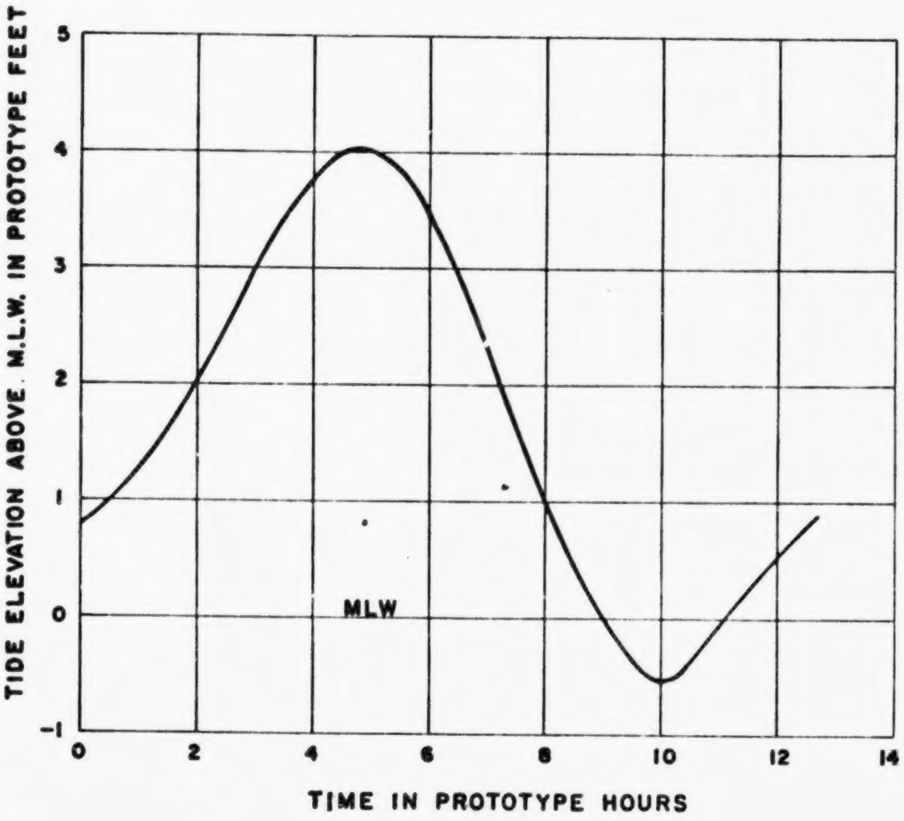
(EXCERPT)

December 1970

Alden Research Laboratories
Worcester Polytechnical Institute
Worcester, Massachusetts


MODEL LIMITS
SOMERSET
MAG. NORTH
CALLED NORTH
TAUNTON RIVER
LEE RIVER
BRAYTON POINT
SOUTH SWANSEA
FALL RIVER
MOUNT HOPE BAY
MODEL WALLS
E-2
MASSACHUSETTS
RHODE ISLAND

Outline of Model Walls



Note:

Curve based on data taken on April 28, 1970 and May 5, 1970 by Raytheon Company, Submarine Signal Division, New London, Connecticut.

BRAYTON POINT MODEL STUDY

TIDE ELEVATION
vs
TIME

MODEL STUDY CURVE USED AT
ALDEN RESEARCH LABORATORIES
WORCESTER POLYTECHNIC INSTITUTE

Fig. 13

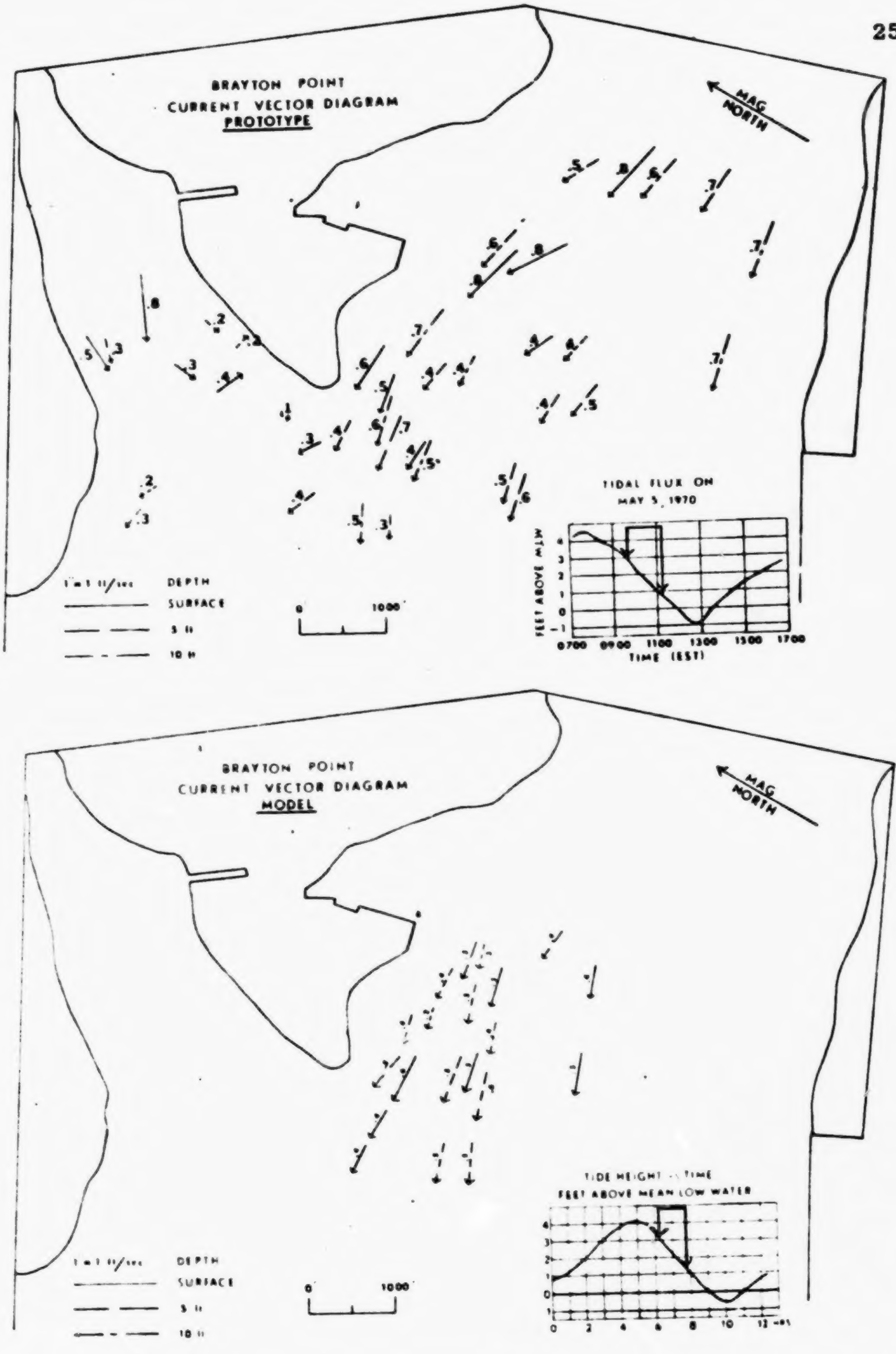

BRAYTON POINT
CURRENT VECTOR DIAGRAM
PROTOTYPE
MAG NORTH
TIDAL FLUX ON
MAY 5, 1970
FEET ABOVE MLW
TIME (EST)
0700
0900
1100
1300
1500
1700
1" = 1 ft/sec
DEPTH
SURFACE
5 ft
10 ft
0
1000'
BRAYTON POINT
CURRENT VECTOR DIAGRAM
MODEL
MAG NORTH
TIDE HEIGHT vs TIME
FEET ABOVE MEAN LOW WATER
0
2
4
6
8
10
12 HRS
1" = 1 ft/sec
DEPTH
SURFACE
5 ft
10 ft
0
1000'

Fig. 14 Model-Prototype Verification

E-4

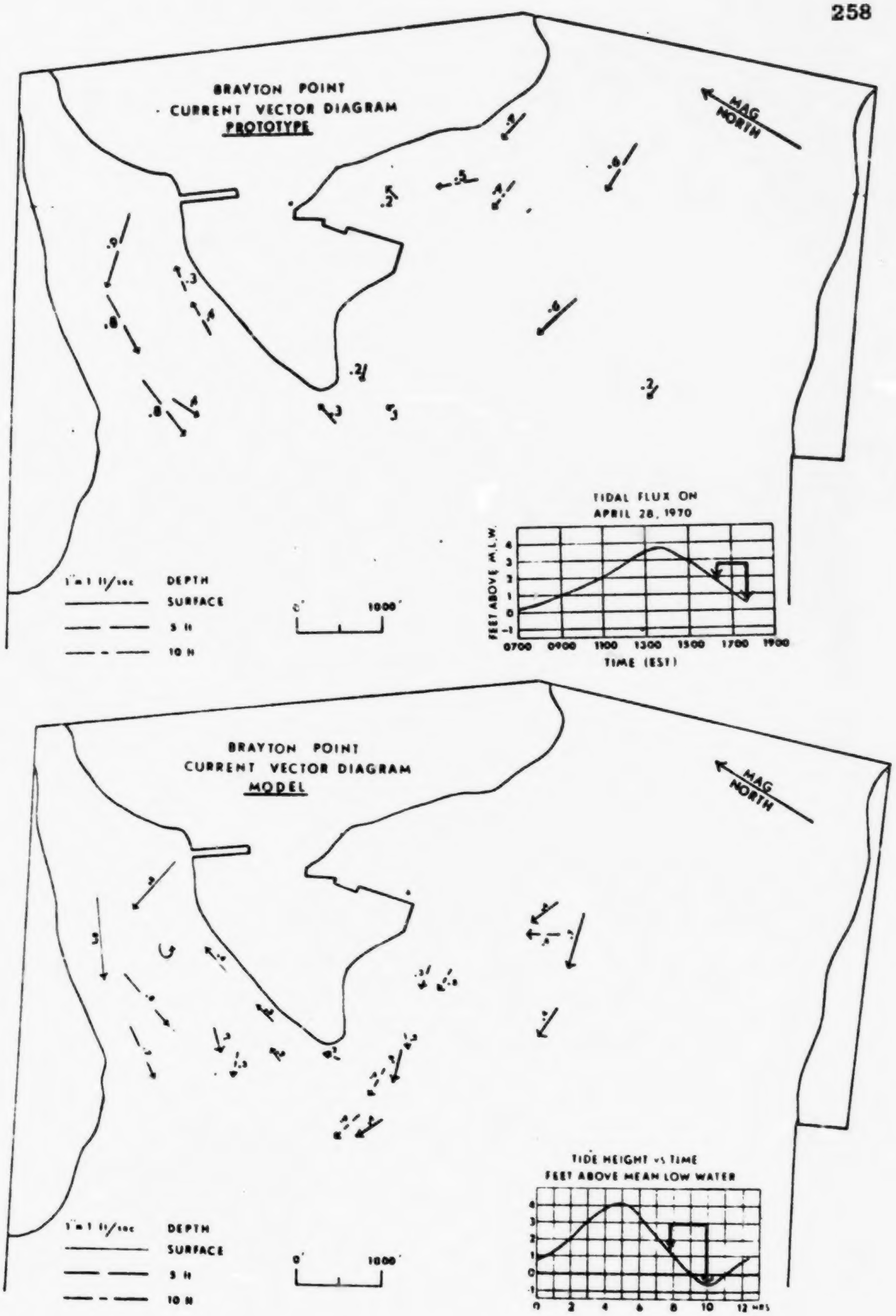
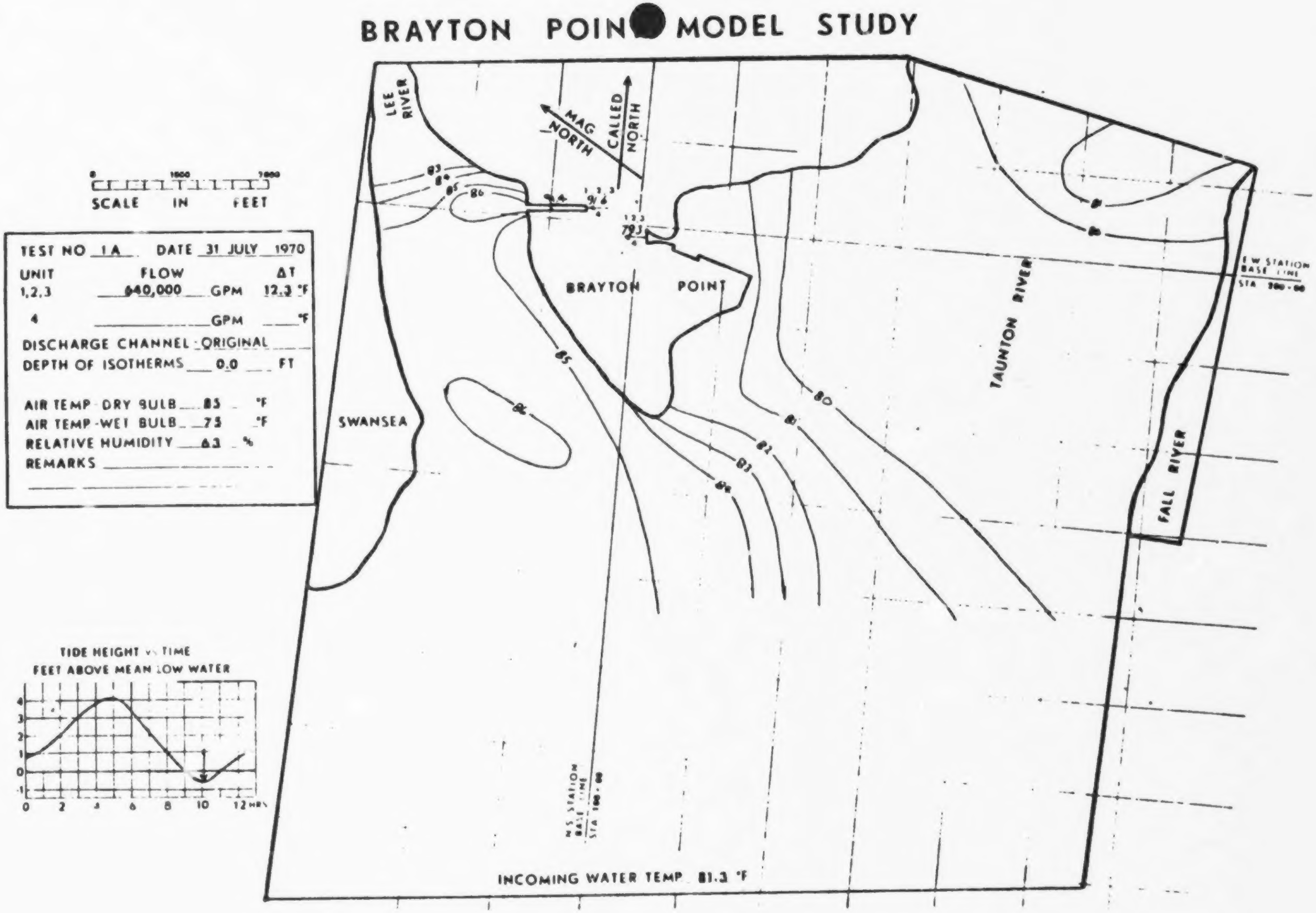

BRAYTON POINT
CURRENT VECTOR DIAGRAM
PROTOTYPE
MAG NORTH
1" = 1 ft/sec
DEPTH
SURFACE
5 ft
10 ft
0'
1000'
TIDAL FLUX ON
APRIL 28, 1970
FEET ABOVE M.L.W.
TIME (EST)
0700
0900
1100
1300
1500
1700
1900
BRAYTON POINT
CURRENT VECTOR DIAGRAM
MODEL
MAG NORTH
TIDE HEIGHT vs TIME
FEET ABOVE MEAN LOW WATER
HRS

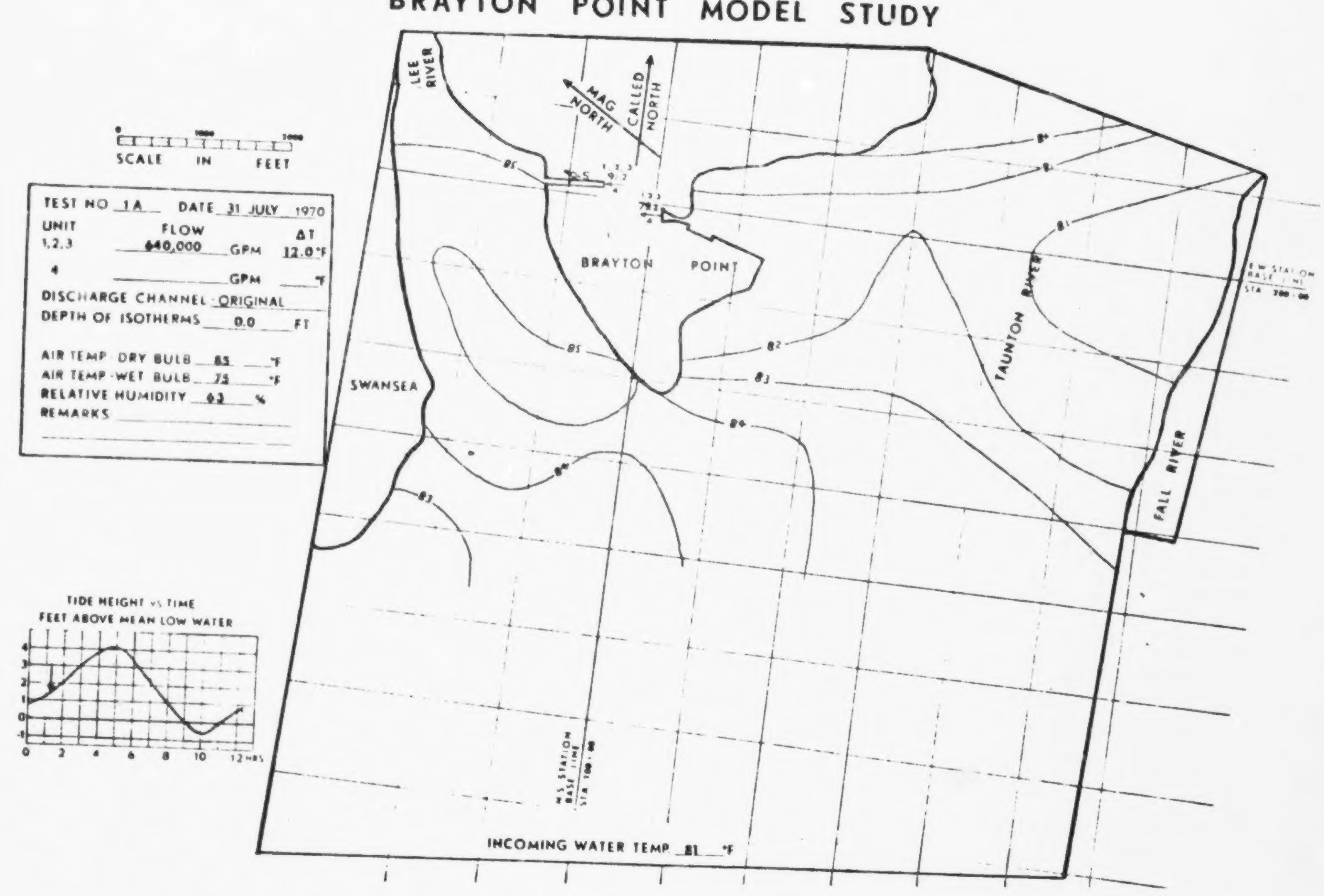
Fig. 15 Model-Prototype Verification


BRAYTON POIN MODEL STUDY
0
1000
2000
SCALE IN FEET
LEE RIVER
MAG NORTH
CALLED NORTH
83
84
85
86
1,2,3
4
BRAYTON POINT
TAUNTON RIVER
FALL RIVER
SWANSEA
85
86
80
81
82
83
84
E-W STATION BASE LINE STA 200+00
N-S STATION BASE LINE STA 100+00
INCOMING WATER TEMP 81.3 °F
TIDE HEIGHT vs TIME
FEET ABOVE MEAN LOW WATER
4
3
2
1
0
-1
0
2
4
6
8
10
12 HRS

TEST NO 1A DATE 31 JULY 1970
UNIT FLOW ΔT
1,2,3 640,000 GPM 12.3 °F
4 GPM °F
DISCHARGE CHANNEL: ORIGINAL
DEPTH OF ISOTHERMS 0.0 FT

AIR TEMP - DRY BULB 85 °F
AIR TEMP - WET BULB 75 °F
RELATIVE HUMIDITY 63 %
REMARKS

Fig. 16 Original Discharge Channel. 3-Unit Operation. Surface Isotherms at Low Water Slack


BRAYTON POINT MODEL STUDY
LEE RIVER
MAG NORTH
CALLED NORTH
BRAYTON POINT
SWANSEA
TAUNTON RIVER
FALL RIVER
85
85
85
84
84
83
83
82
81
81
81
E-W STATION BASE LINE
STA 200+00
N-S STATION BASE LINE
STA 100+00
INCOMING WATER TEMP 81 °F
0
1000
2000
SCALE IN FEET
TIDE HEIGHT vs TIME
FEET ABOVE MEAN LOW WATER
4
3
2
1
0
-1
0
2
4
6
8
10
12 HRS

TEST NO 1A DATE 31 JULY 1970

UNIT FLOW ΔT

1,2,3 640,000 GPM 12.0 °F

4 ____ GPM ____ °F

DISCHARGE CHANNEL ORIGINAL

DEPTH OF ISOTHERMS 0.0 FT

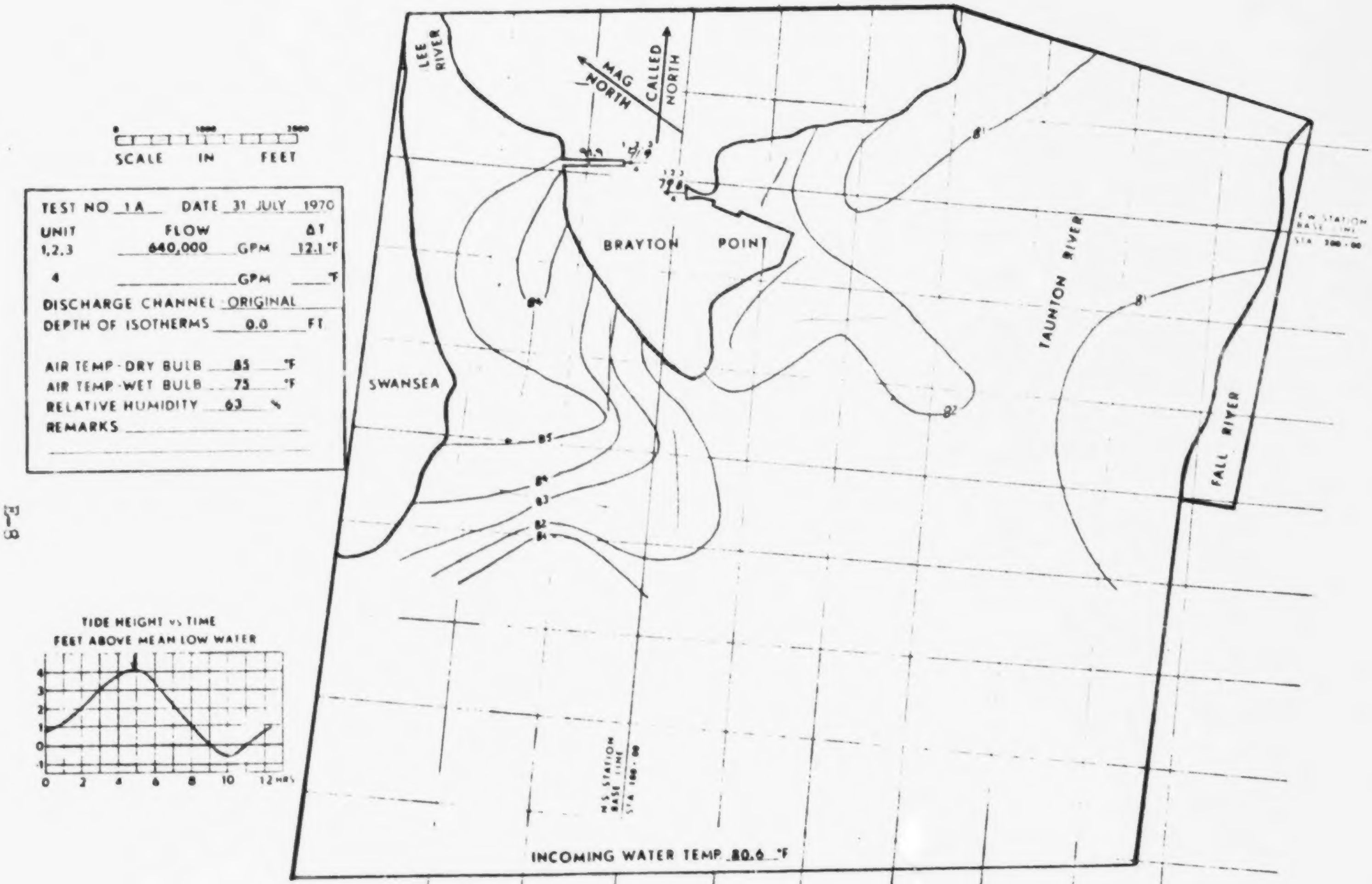
AIR TEMP DRY BULB 85 °F

AIR TEMP-WET BULB 75 °F

RELATIVE HUMIDITY 63 %

REMARKS ____

Fig. 17 Original Discharge Channel. 3-Unit Operation. Surface Isotherms at Mid-Point of Flood Tide


BRAYTON POINT MODEL STUDY
LEE RIVER
MAG NORTH
CALLED NORTH
BRAYTON POINT
SWANSEA
TAUNTON RIVER
FALL RIVER
E-W STATION BASE LINE STA 200+00
N-S STATION BASE LINE STA 100+00
84
85
84
83
82
84
81
81
82
0
1000
2000
SCALE IN FEET
TIDE HEIGHT vs TIME
FEET ABOVE MEAN LOW WATER
4
3
2
1
0
-1
0
2
4
6
8
10
12 HRS

TEST NO 1A DATE 31 JULY 1970

UNIT	FLOW	ΔT
1,2,3	640,000 GPM	12.1 °F
4	GPM	°F

DISCHARGE CHANNEL ORIGINAL

DEPTH OF ISOTHERMS 0.0 FT

AIR TEMP - DRY BULB 85 °F

AIR TEMP - WET BULB 75 °F

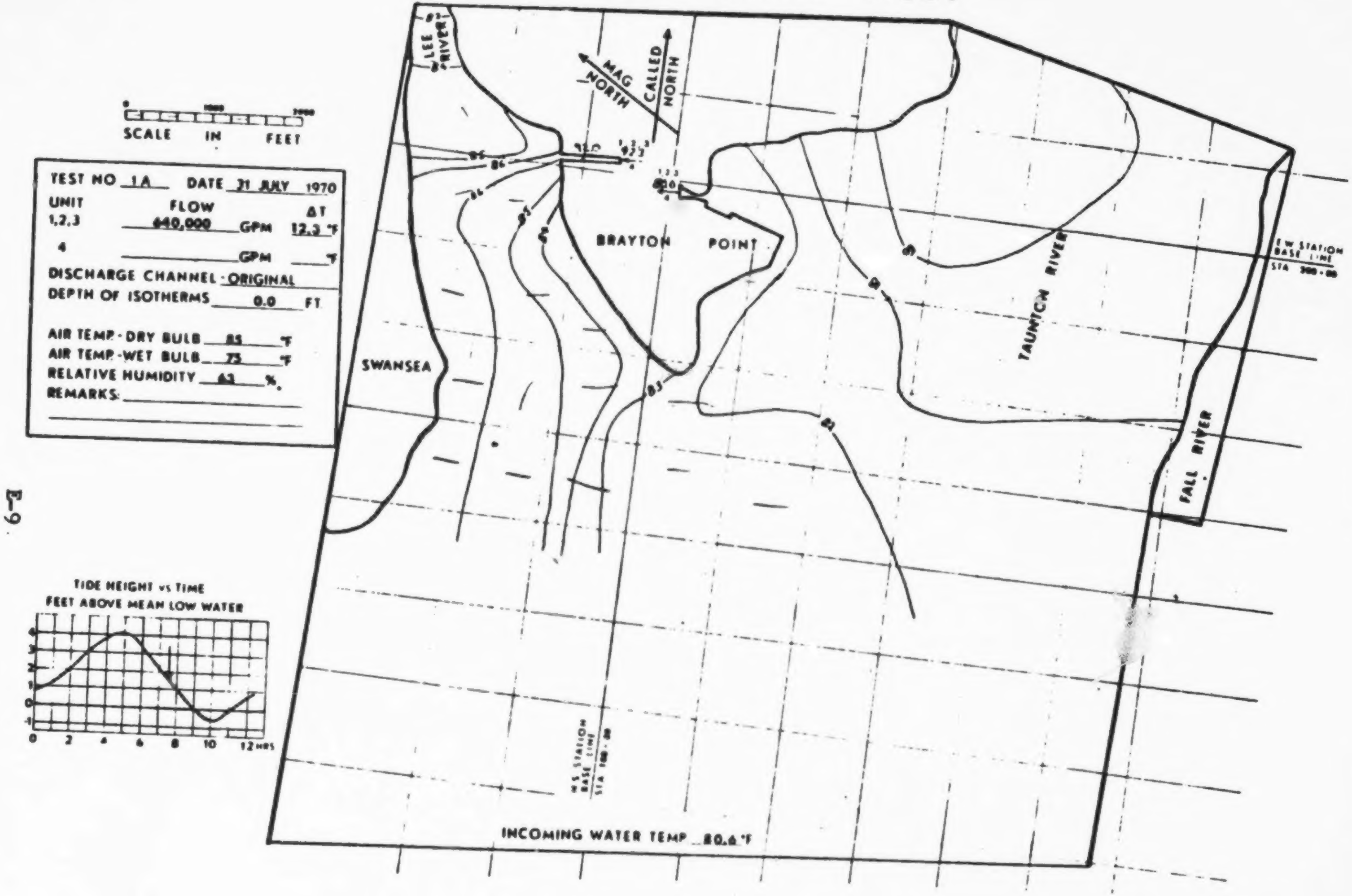
RELATIVE HUMIDITY 63 %

REMARKS

INCOMING WATER TEMP 80.6 °F

Fig. 18 Original Discharge Channel. 3-Unit Operation. Surface Isotherms at High Water Slack

BRAYTON POINT MODEL STUDY



SCALE IN FEET
0
1000
2000
LEE RIVER
MAG NORTH
CALLED NORTH
BRAYTON POINT
SWANSEA
TAUNTON RIVER
FALL RIVER
E-W STATION BASE LINE STA 300+00
N-S STATION BASE LINE STA 100+00
86
86
86
85
84
83
82
81
1,2,3
4
TIDE HEIGHT vs TIME
FEET ABOVE MEAN LOW WATER
0
2
4
6
8
10
12 HRS

TEST NO 1A DATE 21 JULY 1970

UNIT 1,2,3 FLOW 640,000 GPM ΔT 12.3 °F

4 ______ GPM ______ °F

DISCHARGE CHANNEL - ORIGINAL

DEPTH OF ISOTHERMS 0.0 FT

AIR TEMP. - DRY BULB 85 °F

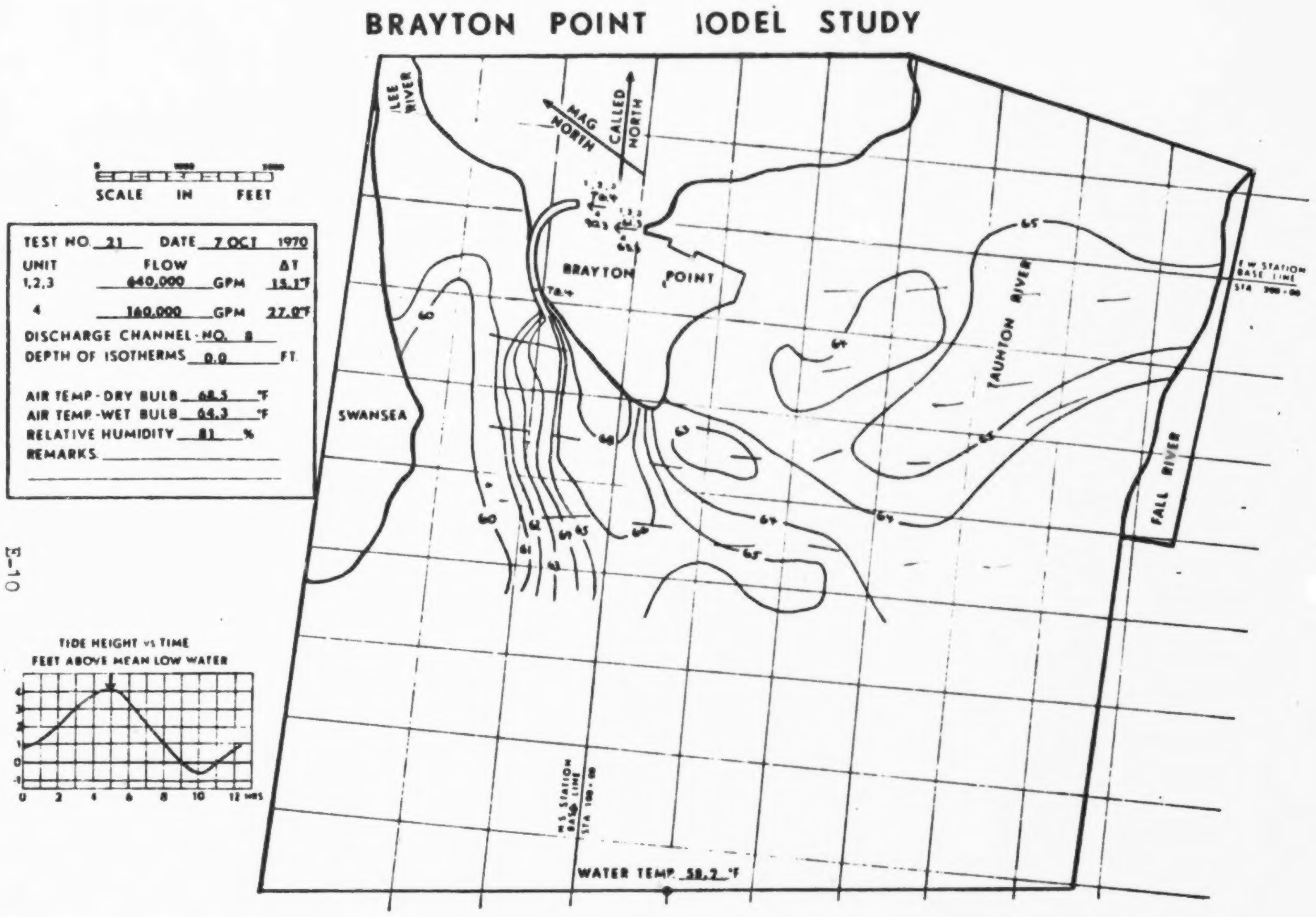
AIR TEMP. - WET BULB 75 °F

RELATIVE HUMIDITY 63 %.

REMARKS: ______

INCOMING WATER TEMP 80.6 °F

Fig. 19 Original Discharge Channel. 3-Unit Operation. Surface Isotherms at Mid-Point of Ebb Tide


BRAYTON POINT IODEL STUDY
0
1000
2000
SCALE IN FEET
LEE RIVER
MAG NORTH
CALLED NORTH
BRAYTON POINT
SWANSEA
TAUNTON RIVER
FALL RIVER
E.W. STATION BASE LINE STA 200+00
N.S. STATION BASE LINE STA 100+00
78.4
60
61
62
63
64
65
WATER TEMP. 58.2 °F
TIDE HEIGHT vs TIME
FEET ABOVE MEAN LOW WATER
4
3
2
1
0
-1
0
2
4
6
8
10
12 HRS

TEST NO. 21 DATE 7 OCT 1970

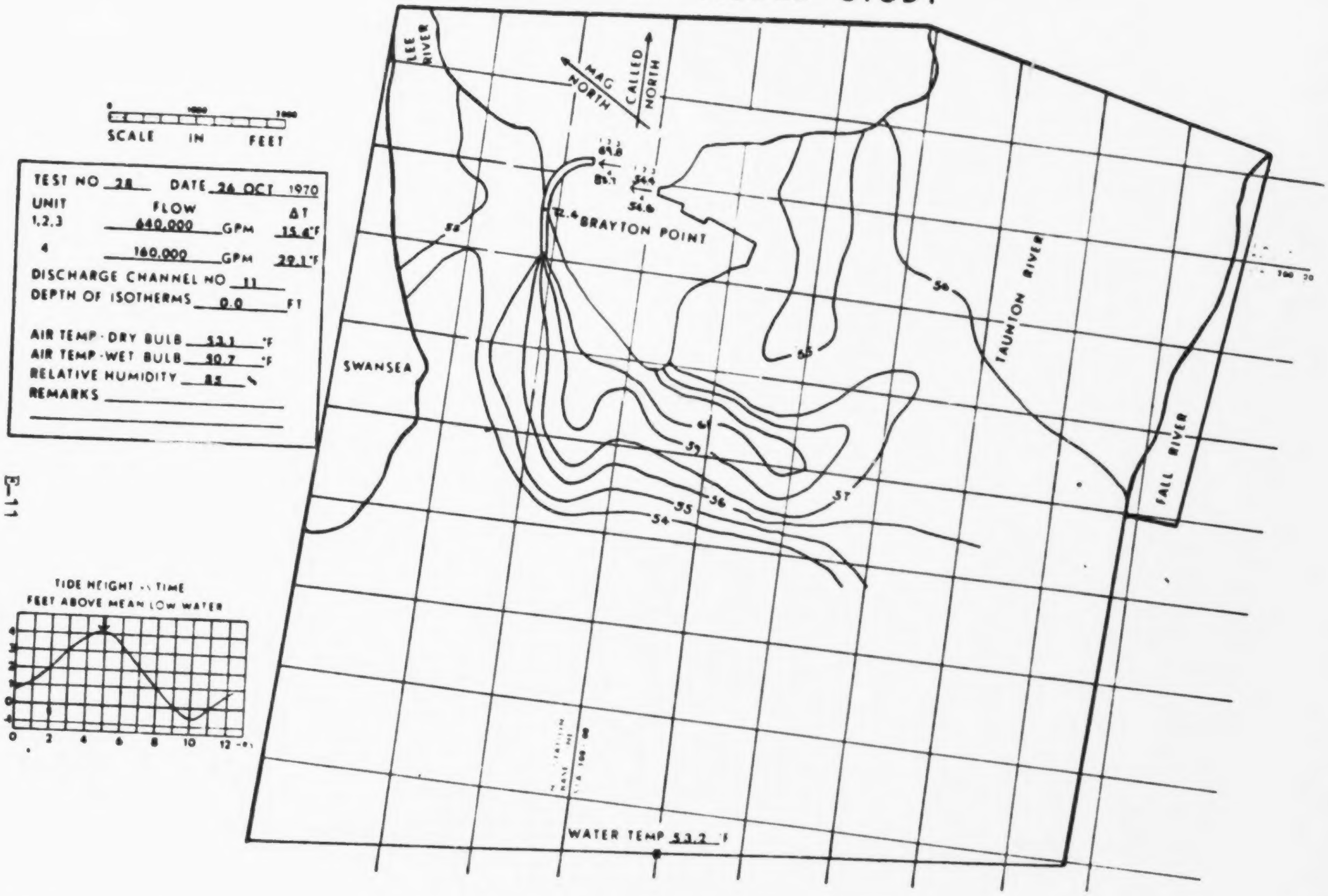
UNIT	FLOW	ΔT
1,2,3	640,000 GPM	15.1°F
4	160,000 GPM	27.0°F

DISCHARGE CHANNEL-NO. 8
DEPTH OF ISOTHERMS 0.0 FT.

AIR TEMP.-DRY BULB 68.5 °F
AIR TEMP.-WET BULB 64.3 °F
RELATIVE HUMIDITY 81 %
REMARKS

Fig. 20 Discharge Channel Parallel to Brayton Point Shore Line. 4-Unit Operation Surface Isotherm at High Water Slack

BRAYTON POINT MODEL STUDY


LEE RIVER
MAG NORTH
CALLED NORTH
BRAYTON POINT
SWANSEA
TAUNTON RIVER
FALL RIVER
SCALE IN FEET
0
1000
2000
64.8
54.6
72.4
56
55
61
59
57
56
55
54
TIDE HEIGHT vs TIME
FEET ABOVE MEAN LOW WATER
0
2
4
6
8
10
12

TEST NO 28 DATE 26 OCT 1970

UNIT	FLOW	ΔT
1,2,3	640,000 GPM	15.6°F
4	160,000 GPM	29.1°F

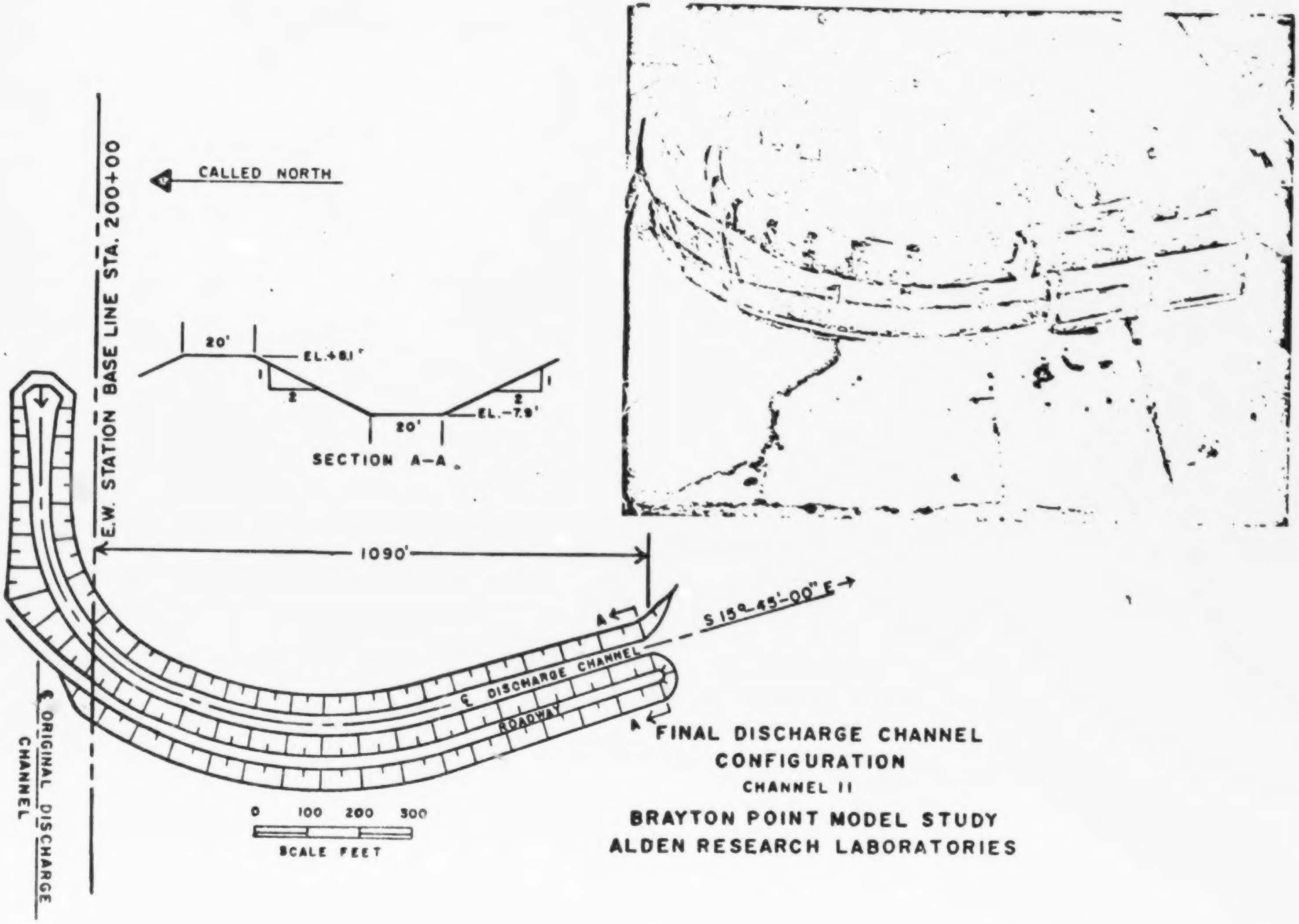
DISCHARGE CHANNEL NO 11
DEPTH OF ISOTHERMS 0.0 FT

AIR TEMP - DRY BULB 53.1 °F
AIR TEMP - WET BULB 50.7 °F
RELATIVE HUMIDITY 85 %
REMARKS

WATER TEMP 53.2 °F

E-11

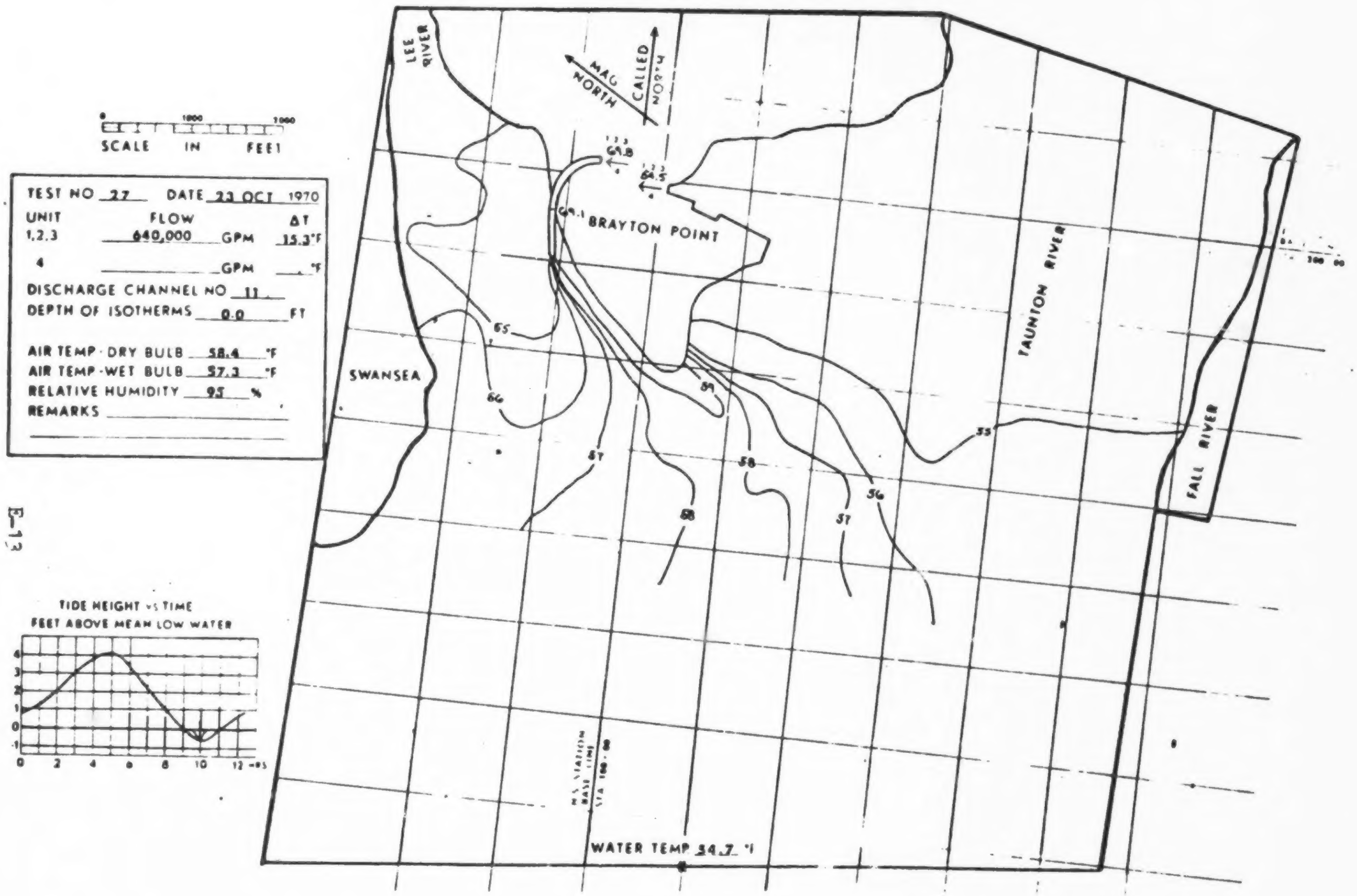
Fig. 21 Recommended Discharge Channel. 4-Unit Operation with Unit 4 Temperature Rise of 29F. Surface Isotherm at High Water Slack


CALLED NORTH
E.W. STATION BASE LINE STA. 200+00
20'
EL.+8.1'
1
2
20'
EL.-7.9'
SECTION A-A
1090'
A
S 15°-45'-00" E
℄ DISCHARGE CHANNEL
ROADWAY
℄ ORIGINAL DISCHARGE CHANNEL
0 100 200 300
SCALE FEET

FINAL DISCHARGE CHANNEL
CONFIGURATION
CHANNEL II
BRAYTON POINT MODEL STUDY
ALDEN RESEARCH LABORATORIES

Fig. 22

BRAYTON POINT MODEL STUDY


LEE RIVER
MAG NORTH
CALLED NORTH
1 2 3
69.8
1 2 3
64.5
69.1
BRAYTON POINT
TAUNTON RIVER
SWANSEA
FALL RIVER
65
66
67
68
69
58
57
56
55
N.S. STATION BASE LINE STA 100+00
WATER TEMP 54.7 °F
0
1000
2000
SCALE IN FEET
TIDE HEIGHT vs TIME
FEET ABOVE MEAN LOW WATER
4
3
2
1
0
-1
0
2
4
6
8
10
12 HRS

TEST NO 27 DATE 23 OCT 1970

UNIT FLOW ΔT

1,2,3 640,000 GPM 15.3°F

4 ______ GPM ___ °F

DISCHARGE CHANNEL NO 11

DEPTH OF ISOTHERMS 0.0 FT

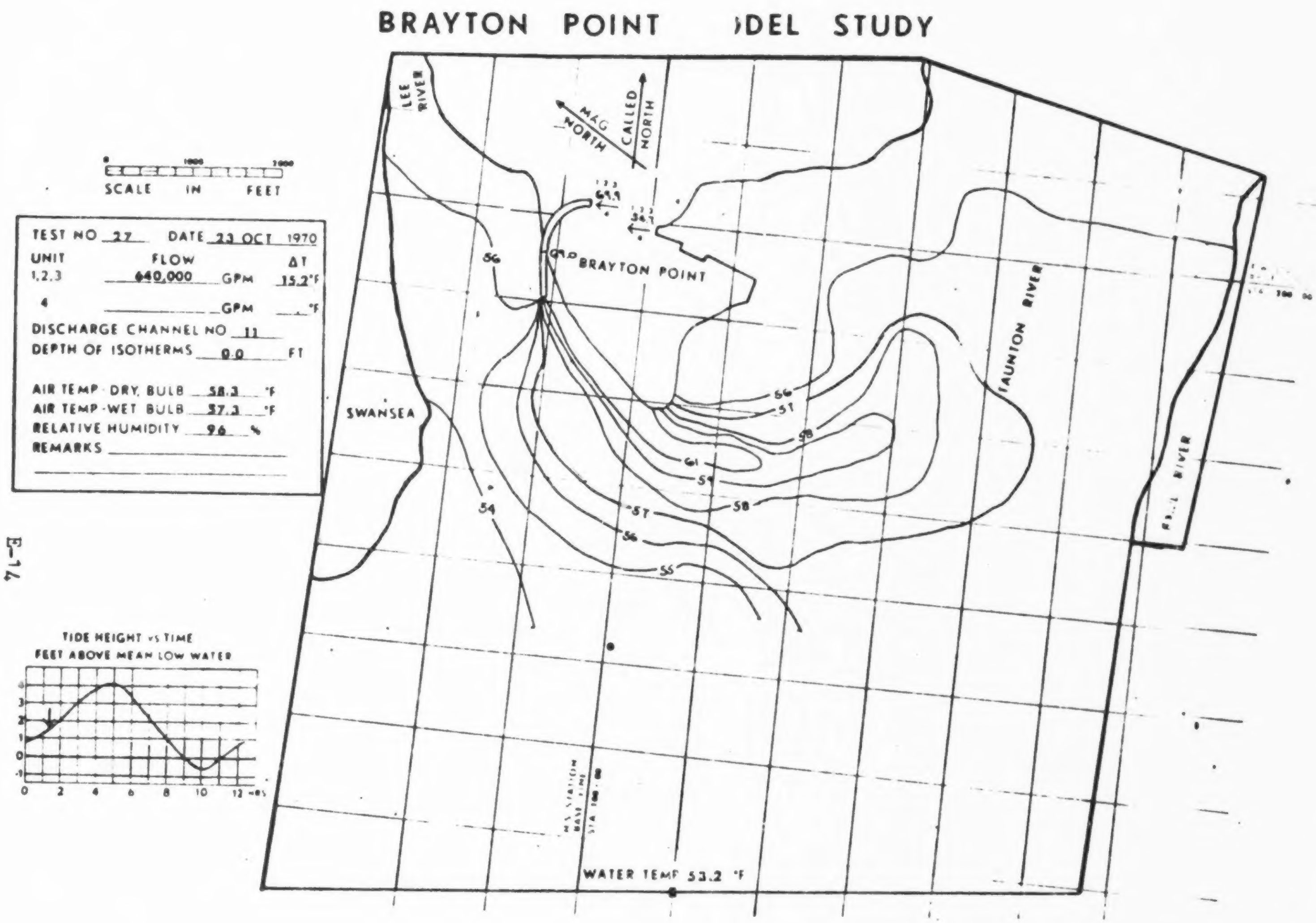
AIR TEMP · DRY BULB 58.4 °F

AIR TEMP · WET BULB 57.3 °F

RELATIVE HUMIDITY 95 %

REMARKS ______

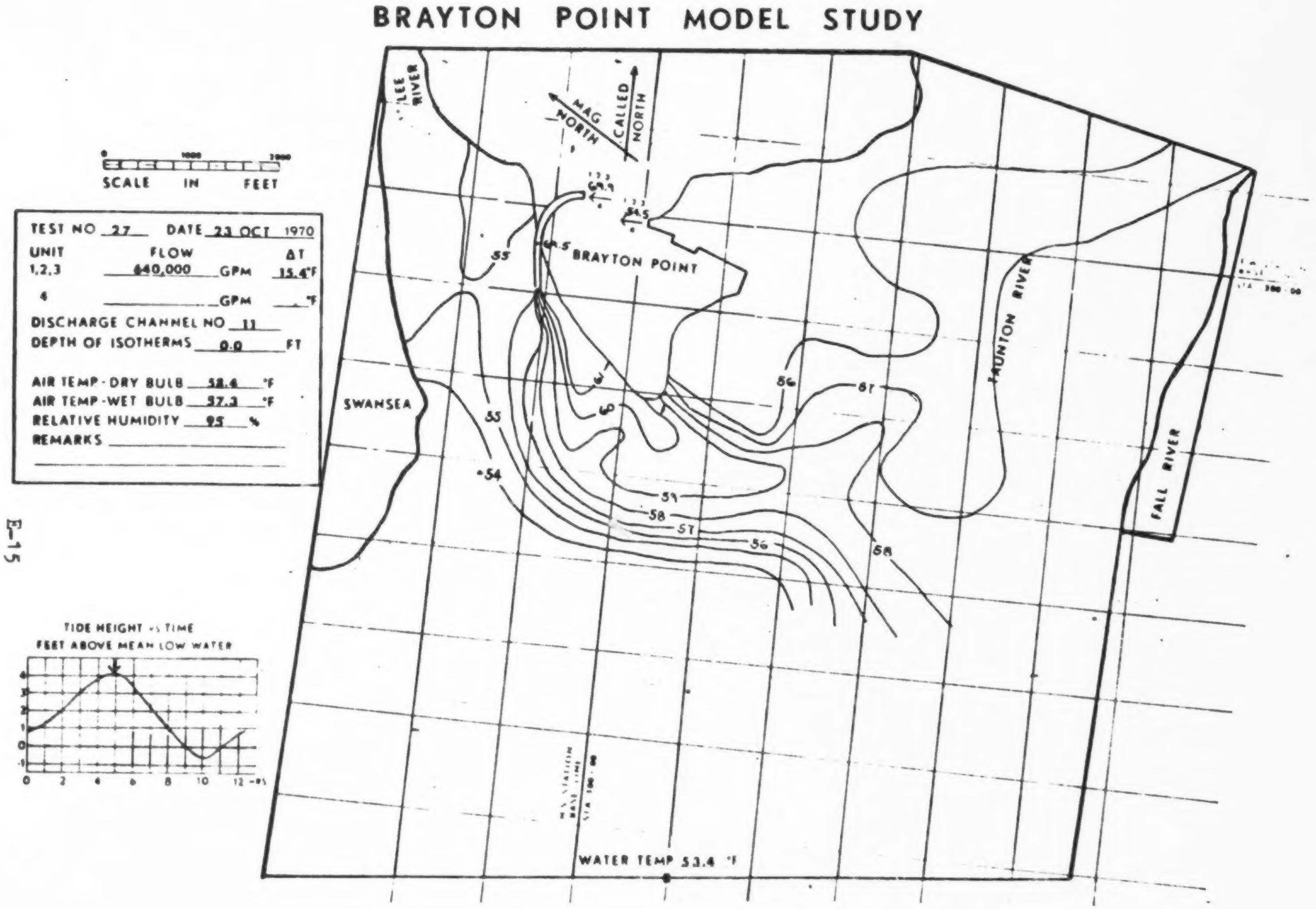
Fig. 23 Recommended Discharge Channel. 3-Unit Operation. Surface Isotherms at Low Water Slack



BRAYTON POINT ODEL STUDY
SCALE IN FEET
0
1000
2000
LEE RIVER
MAG NORTH
CALLED NORTH
BRAYTON POINT
SWANSEA
TAUNTON RIVER
FALL RIVER
56
57
58
61
59
55
54
WATER TEMP 53.2 °F
TIDE HEIGHT vs TIME
FEET ABOVE MEAN LOW WATER
4
3
2
1
0
-1
0
2
4
6
8
10
12 HRS

TEST NO 27 DATE 23 OCT 1970
UNIT FLOW ΔT
1,2,3 640,000 GPM 15.2°F
4 GPM °F
DISCHARGE CHANNEL NO 11
DEPTH OF ISOTHERMS 0.0 FT
AIR TEMP - DRY BULB 58.3 °F
AIR TEMP - WET BULB 57.3 °F
RELATIVE HUMIDITY 96 %
REMARKS

Fig. 24 Recommended Discharge Channel. 3-Unit Operation. Surface Isotherms at Mid-Point of Flood Tide


BRAYTON POINT MODEL STUDY
0
1000
2000
SCALE IN FEET
LEE RIVER
MAG NORTH
CALLED NORTH
69.9
68.5
68.5
BRAYTON POINT
SWANSEA
TAUNTON RIVER
FALL RIVER
55
55
54
56
57
58
59
60
61
56
58
WATER TEMP 53.4 °F
STA 100+00
STA 200+00
TIDE HEIGHT vs TIME
FEET ABOVE MEAN LOW WATER
0
2
4
6
8
10
12 HRS

TEST NO 27 DATE 23 OCT 1970

UNIT FLOW ΔT

1,2,3 640,000 GPM 15.4°F

4 GPM °F

DISCHARGE CHANNEL NO 11

DEPTH OF ISOTHERMS 0.0 FT

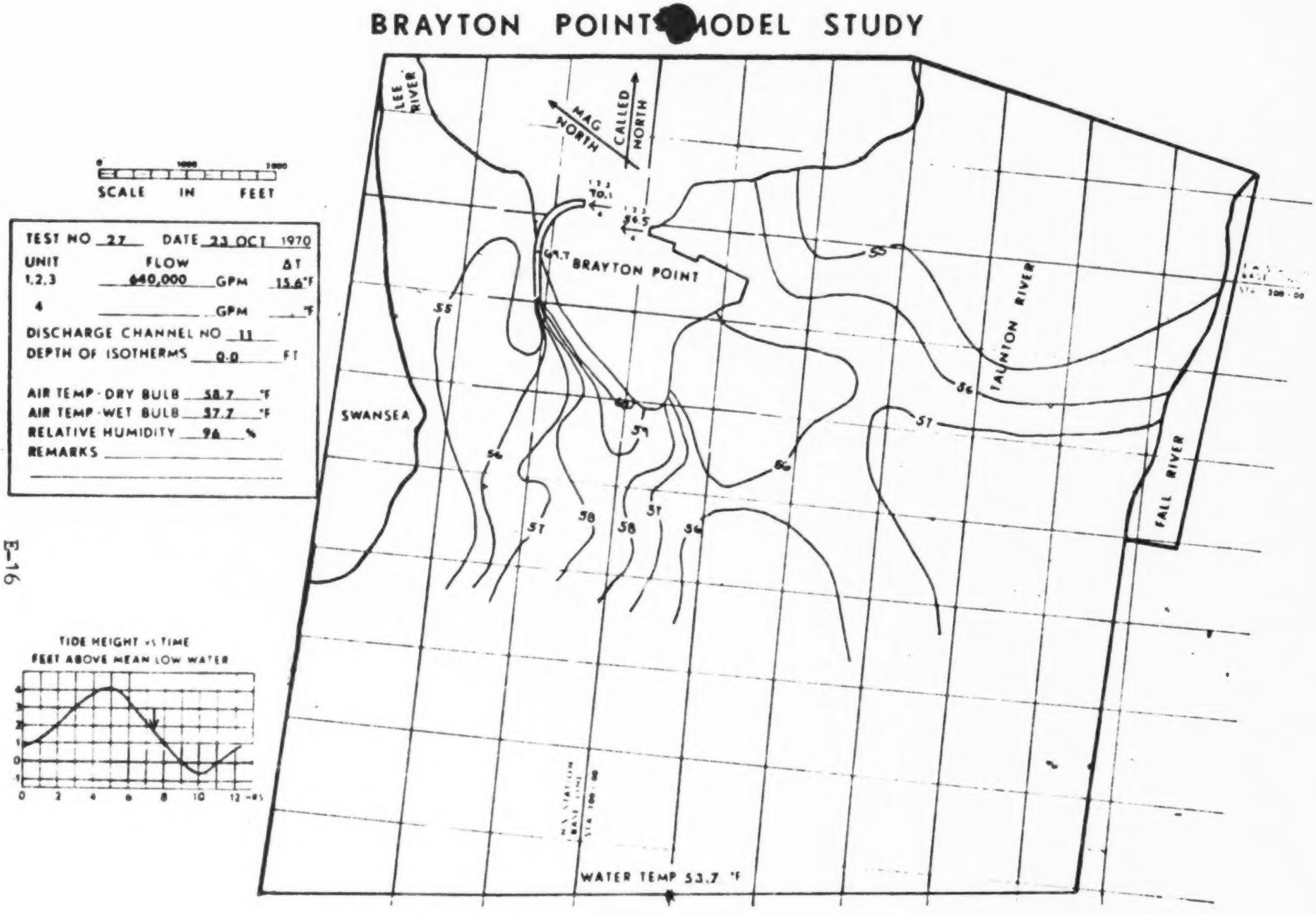
AIR TEMP - DRY BULB 58.4 °F

AIR TEMP - WET BULB 57.3 °F

RELATIVE HUMIDITY 95 %

REMARKS

Fig. 25 Recommended Discharge Channel. 3-Unit Operation. Surface Isotherms at High Water Slack


BRAYTON POINT MODEL STUDY
LEE RIVER
MAG NORTH
CALLED NORTH
70.1
56.5
69.7
BRAYTON POINT
SWANSEA
TAUNTON RIVER
FALL RIVER
55
56
57
58
60
WATER TEMP 53.7 °F
0
1000
2000
SCALE IN FEET
TIDE HEIGHT vs TIME
FEET ABOVE MEAN LOW WATER
4
3
2
1
0
-1
0
2
4
6
8
10
12 HRS

TEST NO 27 DATE 23 OCT 1970

UNIT	FLOW	ΔT
1,2,3	640,000 GPM	15.6°F
4	GPM	°F

DISCHARGE CHANNEL NO 11

DEPTH OF ISOTHERMS 0.0 FT

AIR TEMP - DRY BULB 58.7 °F

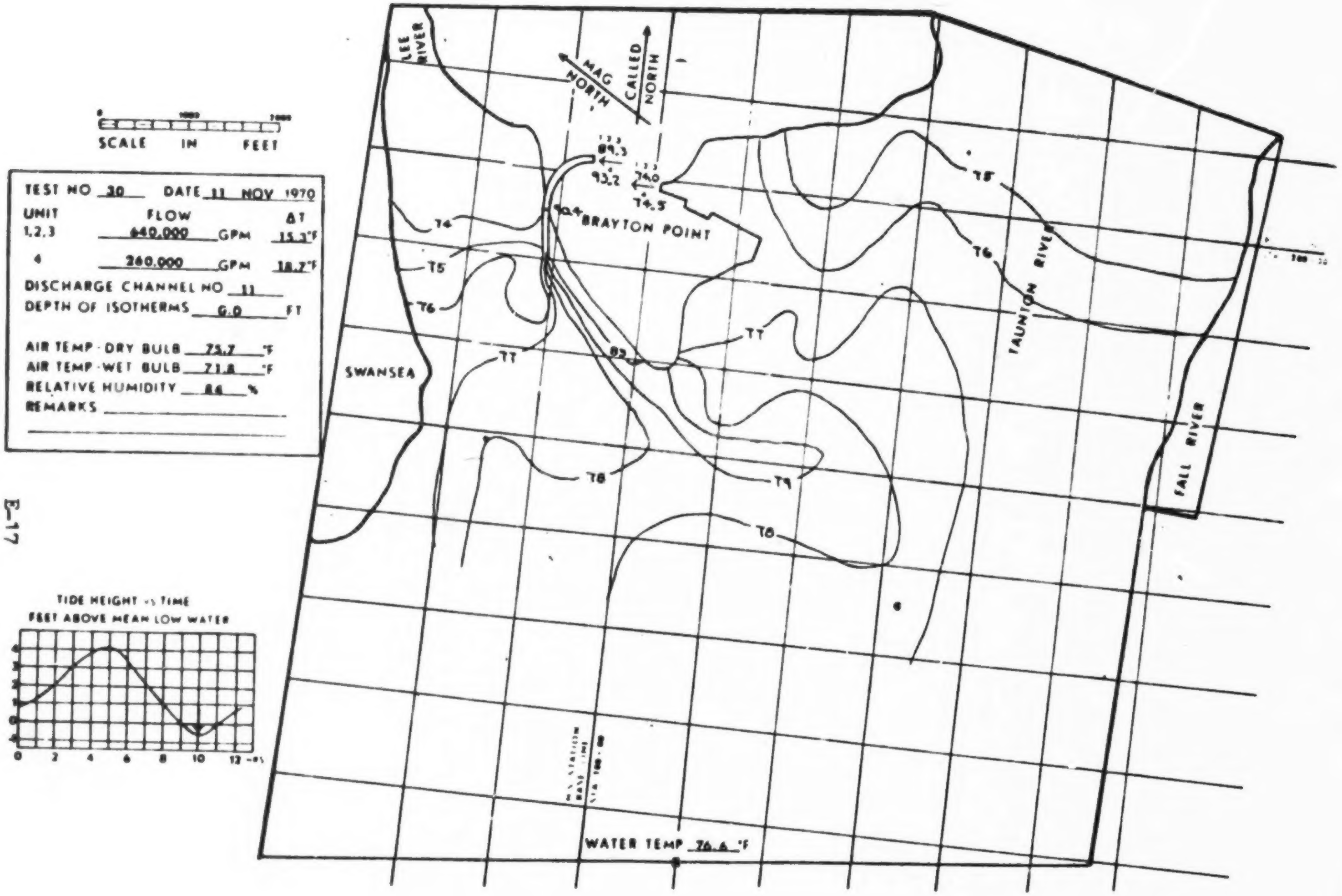
AIR TEMP - WET BULB 57.7 °F

RELATIVE HUMIDITY 96 %

REMARKS

Fig. 26 Recommended Discharge Channel. 3-Unit Operation. Surface Isotherms at Mid-Point of Ebb Tide.

BRAYTON POINT MODEL STUDY


LEE RIVER
MAG NORTH
CALLED NORTH
1,2,3
89.5
93.2
90.4
1,2,3
74.0
4
74.5
BRAYTON POINT
T4
T5
T6
T7
T8
T9
82
SWANSEA
T5
T6
TAUNTON RIVER
FALL RIVER
WATER TEMP 76.6 °F
0
1000
2000
SCALE IN FEET
TIDE HEIGHT vs TIME
FEET ABOVE MEAN LOW WATER
0
2
4
6
8
10
12 HRS

TEST NO 30 DATE 11 NOV 1970

UNIT FLOW ΔT

1,2,3 640,000 GPM 15.3°F

4 260,000 GPM 18.2°F

DISCHARGE CHANNEL NO 11

DEPTH OF ISOTHERMS 6.0 FT

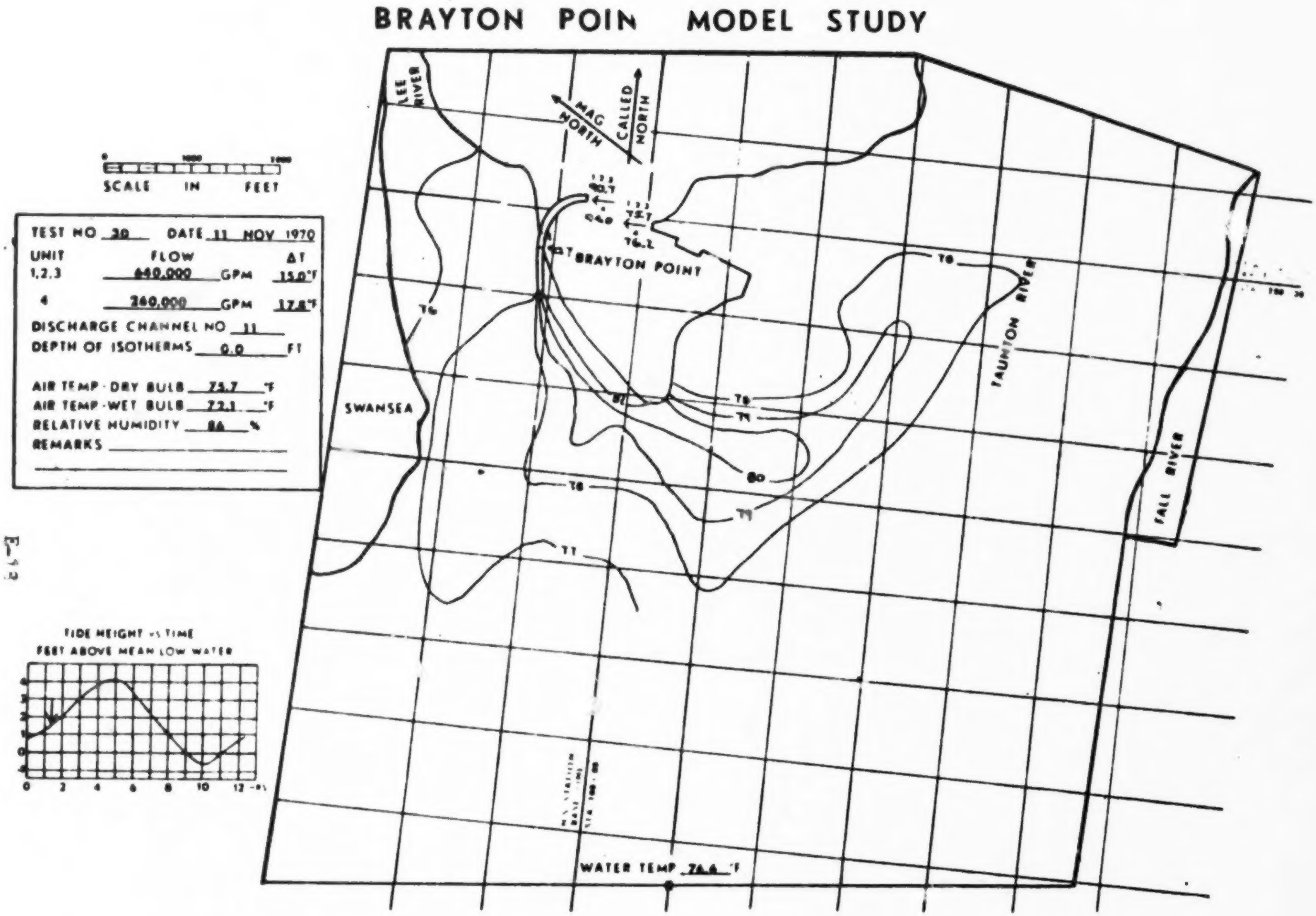
AIR TEMP - DRY BULB 75.7 °F

AIR TEMP - WET BULB 71.8 °F

RELATIVE HUMIDITY 84 %

REMARKS

Fig. 27 Recommended Discharge Channel. 4-Unit Operation. Surface Isotherms at Low Water Slack


BRAYTON POIN MODEL STUDY
SCALE IN FEET
0
1000
2000
LEE RIVER
MAG NORTH
CALLED NORTH
BRAYTON POINT
SWANSEA
TAUNTON RIVER
FALL RIVER
76
78
79
80
77
81
WATER TEMP 76.6 °F
TIDE HEIGHT vs TIME
FEET ABOVE MEAN LOW WATER
0
2
4
6
8
10
12
E-13

TEST NO 30 DATE 11 NOV 1970

UNIT FLOW ΔT

1,2,3 640,000 GPM 15.0°F

4 260,000 GPM 17.8°F

DISCHARGE CHANNEL NO 11

DEPTH OF ISOTHERMS 0.0 FT

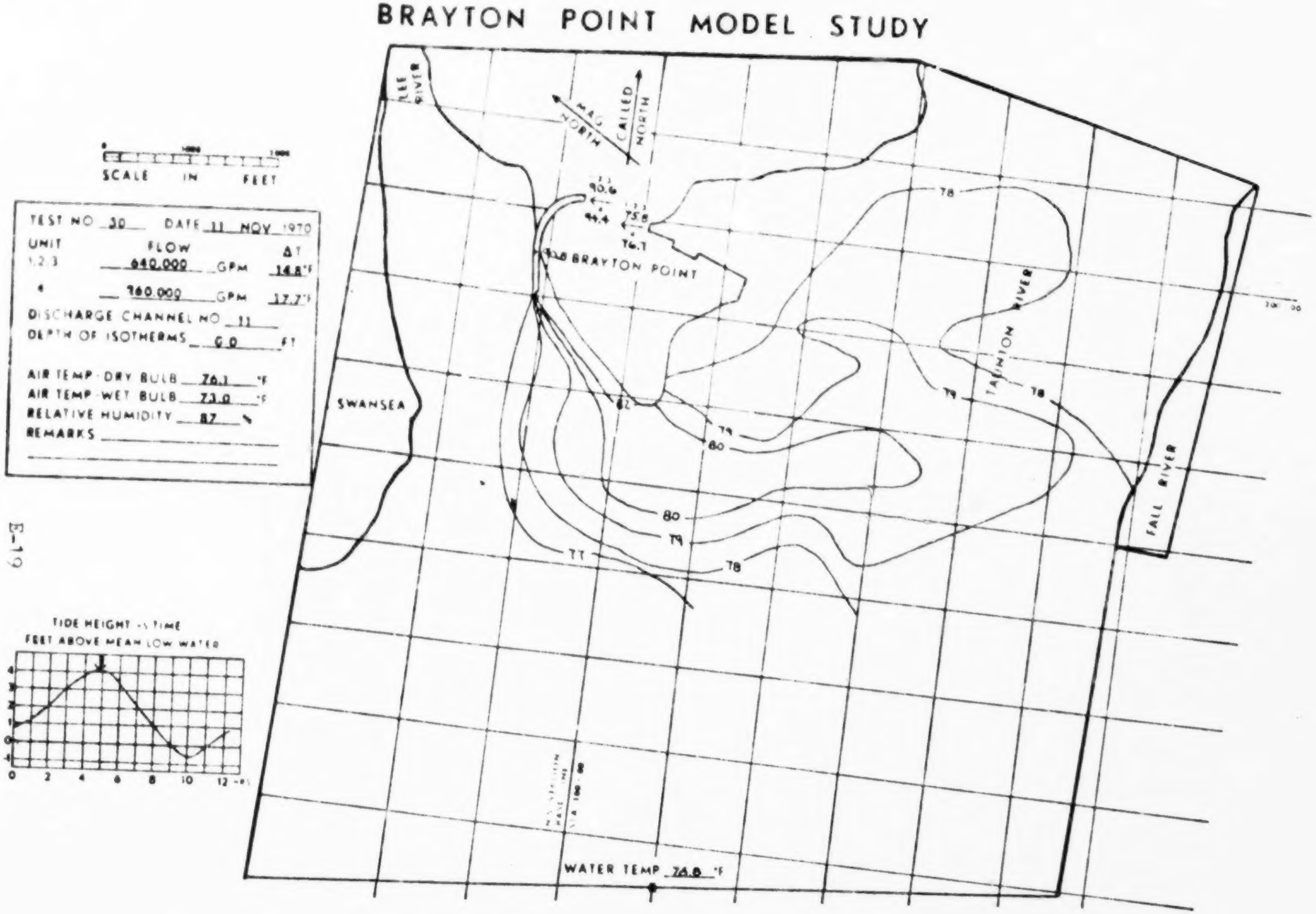
AIR TEMP - DRY BULB 75.7 °F

AIR TEMP - WET BULB 72.1 °F

RELATIVE HUMIDITY 86 %

REMARKS

Fig. 28 Recommended Discharge Channel. 4-Unit Operation. Surface Isotherms at Mid-Point of Flood Tide


BRAYTON POINT MODEL STUDY
SCALE IN FEET
0
1000
2000
LEE RIVER
MAG NORTH
CALLED NORTH
90.6
94.4
75.8
76.1
BRAYTON POINT
SWANSEA
TAUNTON RIVER
FALL RIVER
78
79
80
82
77
WATER TEMP 74.8 °F
TIDE HEIGHT vs TIME
FEET ABOVE MEAN LOW WATER
0
2
4
6
8
10
12

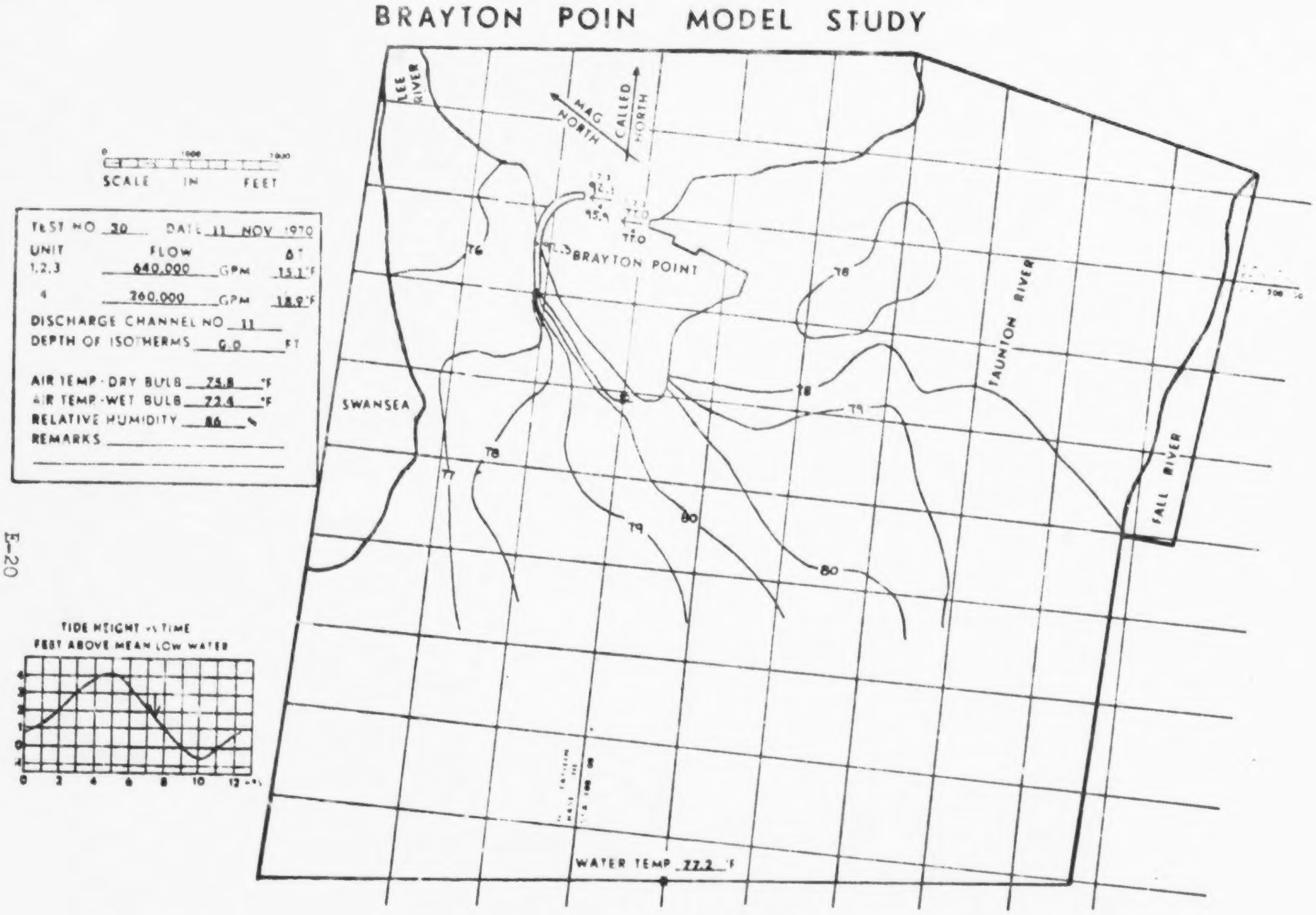
TEST NO 30 DATE 11 NOV 1970

UNIT	FLOW		ΔT
1,2,3	640,000	GPM	14.8 °F
4	960,000	GPM	17.7 °F

DISCHARGE CHANNEL NO 11
DEPTH OF ISOTHERMS 6.0 FT

AIR TEMP - DRY BULB 76.1 °F
AIR TEMP - WET BULB 73.0 °F
RELATIVE HUMIDITY 87 %
REMARKS

Fig. 29 Recommended Discharge Channel. 4-Unit Operation. Surface Isotherms at High Water Slack


BRAYTON POIN MODEL STUDY
LEE RIVER
MAG NORTH
CALLED NORTH
BRAYTON POINT
SWANSEA
TAUNTON RIVER
FALL RIVER
76
77
78
79
80
92.1
95.9
77.0
WATER TEMP 77.2 °F
SCALE IN FEET
0
1000
TIDE HEIGHT vs TIME
FEET ABOVE MEAN LOW WATER
0
2
4
6
8
10
12

TEST NO 30 DATE 11 NOV 1970

UNIT	FLOW	ΔT
1,2,3	640,000 GPM	15.1°F
4	260,000 GPM	18.9°F

DISCHARGE CHANNEL NO 11

DEPTH OF ISOTHERMS 6.0 FT

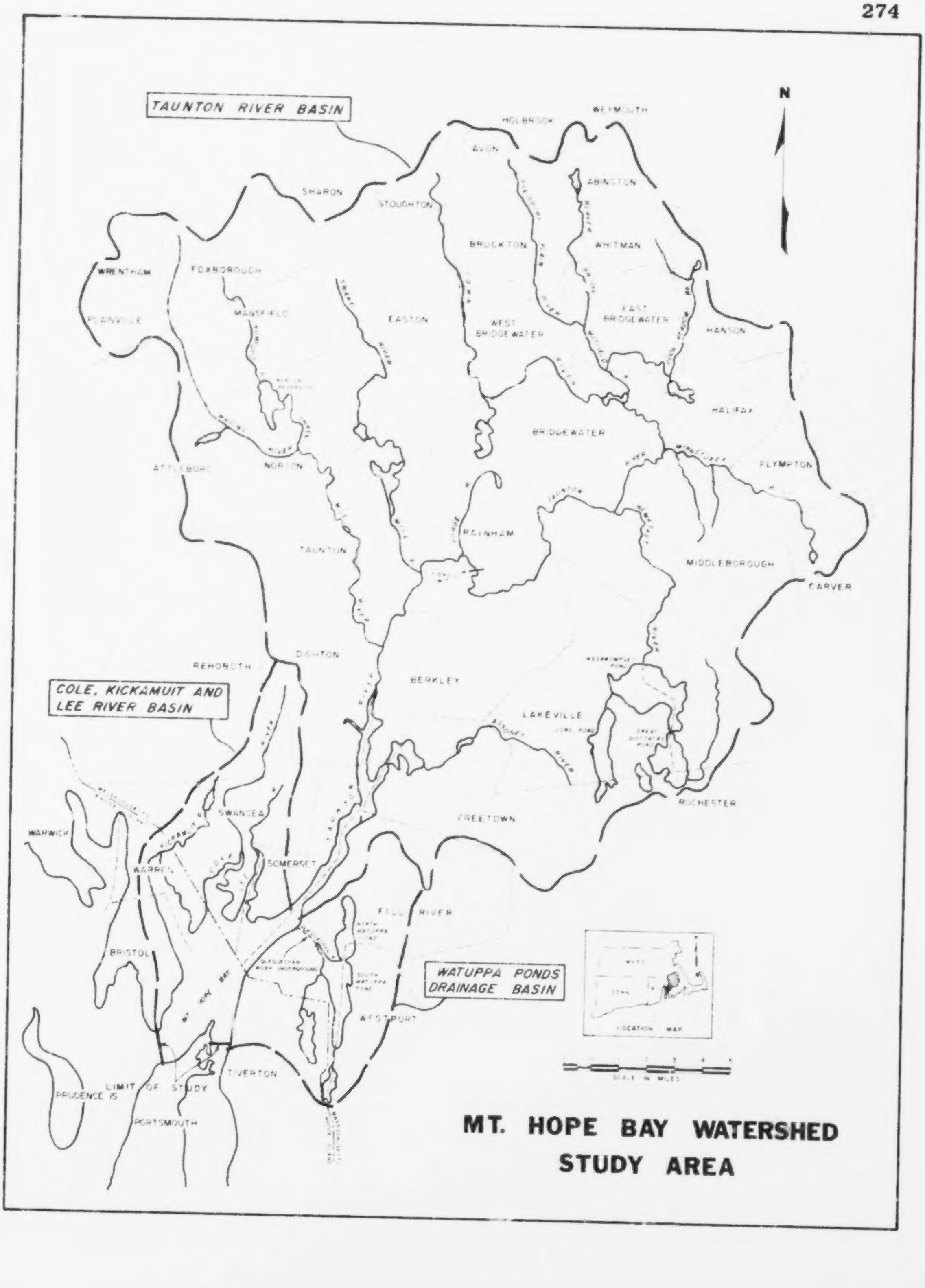
AIR TEMP - DRY BULB 75.8 °F

AIR TEMP - WET BULB 72.4 °F

RELATIVE HUMIDITY 86 %

REMARKS

Fig. 30 Recommended Discharge Channel. 4-Unit Operation. Surface Isotherms at Mid-Point of Ebb Tide


TAUNTON RIVER BASIN
COLE, KICKAMUIT AND LEE RIVER BASIN
WATUPPA PONDS DRAINAGE BASIN
N
HOLBROOK
WEYMOUTH
AVON
ABINGTON
SHARON
STOUGHTON
BROCKTON
WHITMAN
WRENTHAM
FOXBOROUGH
PLAINVILLE
MANSFIELD
EASTON
WEST BRIDGEWATER
EAST BRIDGEWATER
HANSON
HALIFAX
BRIDGEWATER
PLYMPTON
ATTLEBORO
NORTON
RAINHAM
TAUNTON
MIDDLEBOROUGH
CARVER
REHOBOTH
DIGHTON
BERKLEY
LAKEVILLE
ROCHESTER
FREETOWN
SWANSEA
WARWICK
WARREN
SOMERSET
FALL RIVER
BRISTOL
MT. HOPE BAY
WESTPORT
TIVERTON
LIMIT OF STUDY
PRUDENCE IS
PORTSMOUTH
LOCATION MAP
SCALE IN MILES

MT. HOPE BAY WATERSHED STUDY AREA

MR. KNUDSON: Mr. Chairman, at this time this completes the presentation.

MR. STEIN: Thank you, Mr. Knudson.

I think before we ask for comments or questions we will take a 10-minute recess.

(Whereupon, a recess was taken.)

MR. STEIN: Let's reconvene.

Are there any comments or questions on Mr. Knudson's presentation?

MR. PAHREN: I have a question. In your last recommendation, Mr. Knudson, you indicated that there would be certain conditions that would insure that the environmental standards are met at all times as a result of New England Power Company's discharge. Could you elaborate on what conditions might be necessary to meet environmental standards?

MR. KNUDSON: With your permission, I would like to call on Mr. Corkin to answer that question.

STATEMENT OF

CHARLES CORKIN, II

ENVIRONMENTAL PROTECTION AGENCY, REGION I

BOSTON, MASSACHUSETTS

MR. CORKIN: I am Charles Corkin from the Environmental Protection Agency.

Charles Corkin

Mr. Chairman and conferees, following are the conditions recommended by EPA to the Army Corps of Engineers on that permit application.

The first section is "Definitions."

a. The mixing zone is that volume of water included under a rectangular area extending 1,000 feet west and 2,000 feet east of a north-south line which passes through the point of discharge, and extending 2,000 feet south and 1,000 feet north of an east-west line intersecting the point of discharge.

b. The point of discharge is that point located at latitude North 41 degrees, 42 minutes, 21.35 seconds and longitude West 71 degrees, 11 minutes, 39.25 seconds.

Incidentally, this is 2,900 feet south of the existing outfall.

c. The reference station is that water column under an area located in close proximity to the plant intake structure to be approved by the Corps of Engineers in consultation with the Environmental Protection Agency.

d. Bottom waters are those waters 1 foot or less above the solid bed and/or natural sediment matter.

2. The maximum temperature of the surface and

bottom waters at the edge of the mixing zone shall not exceed the temperature of the surface and bottom waters, respectively, at the reference station by more than 1.5 degrees Fahrenheit during the months of July, August, and September, or by more than 4 degrees Fahrenheit during the remainder of the year. The temperature at no time shall be increased or decreased at a rate exceeding 1 degree Fahrenheit per hour at the edge of the mixing zone. The measurements at the reference station shall be made simultaneously.

3. At the edge of the mixing zone the temperature of the water at any depth shall not exceed 82 degrees Fahrenheit at any time. The temperature of the bottom waters at the edge of the mixing zone shall not exceed 77 degrees Fahrenheit for more than an aggregate of 8 hours in any 24-hour period and shall not exceed 79 degrees Fahrenheit at any time.

4. The temperature at the point of discharge shall not exceed 90 degrees Fahrenheit at any time.

5. The circulating water intake structure shall minimize the entrainment of estuarine organisms (specifically ichthyoplankton) into the cooling water system. The specific intake design may include some combination of sills, screens, or other structures, but

shall meet with the approval of the Bureau of Sport Fisheries and Wildlife, National Marine Fishery Service, the Massachusetts Department of Natural Resources, and the Army Corps of Engineers.

6. Chemical biocides shall not be used for the control of biological fouling in the fourth condenser system. Chemical biocides shall not be used for more than 4 hours a week for the control of biological fouling in the existing three units' condenser systems and shall be used only in a limited flow process, with one water pump for each unit operating and the other water pump for such unit not operating, and with a limited discharge to the seal pit. Chlorine may be used as a biocide in service water systems. Available chlorine in the discharge shall not exceed 1/10 of a part per million at any time.

7. The disposal of fly ash resulting from air emission control and other solid waste created in plant operations shall comply with sound solid waste disposal practices and shall not produce liquid or solid discharges which violate water quality standards. A concentration of 1.0 mg/l in the undiluted discharge will be considered the maximum acceptable level for any heavy metal, unless a more stringent requirement presently exists or is

found to be necessary.

8. The plant operations shall not create any violations of the air ambient quality standards. Stack emissions shall comply with the applicable source performance standards, pursuant to the Clean Air Act of 1970 as it is now in force and as it may hereafter be amended.

9. Environmental monitoring and studies, including bioassays, satisfactory to the Environmental Protection Agency and of a scope suitable to determine compliance with environmental standards, shall be conducted by the company on a continuous basis. The results of these studies shall be reported to the Environmental Protection Agency at intervals approved by the Environmental Protection Agency. The Environmental Protection Agency shall have access to all monitor recording equipment and data at all reasonable times.

10. The company shall, alone or with others, develop and implement an adequate contingency plan to cope with spills of oil or other hazardous materials in the Mount Hope Bay - Taunton River area. The plan shall be approved by the Commonwealth of Massachusetts and the Environmental Protection Agency.

11. Conditions numbered 6, 7, 8, 9, and 10 shall

take effect immediately upon the issuance of this permit. The remainder of the above conditions shall take effect no later than 31 December 1973.

12. The company shall terminate or curtail its operations as necessary in order to comply with the above conditions.

In addition, we are recommending a stipulation as to compliance with these conditions with a provision for liquidated damages.

That completes those conditions, Mr. Chairman.

MR. STEIN: There is one question I have, and this is for clarification. What do you mean about Condition 10 on oil spills to take place immediately and to develop and implement the plan to be approved by Massachusetts and the Environmental Protection Agency? Will they have any time to do that? Or do they have to have the plan all approved? I don't understand what you mean by taking effect immediately.

MR. CORKIN: Do you want to answer that?

MR. PAHREN: Well, immediately upon the issuance of the permit. The plan is essentially complete, and it has been approved by the Commonwealth already as I understand it.

MR. STEIN: What I am saying is: This plan will be in effect on the issuance of the permit or will they have time after the permit issues to develop it? What is your recommendation? I don't understand what you are trying to get at.

MR. PAHREN: It would go into effect immediately.

MR. STEIN: All right. In other words, you are saying that the company alone or with others will have a plan, an adequate contingency plan, to cope with spills of oil or other hazardous material in the Mount Hope Bay - Taunton River area, and the plan shall be approved by the Commonwealth of Massachusetts and the Environmental Protection Agency, but the Environmental Protection Agency will recommend that the permit not be issued unless that is all done?

MR. CORKIN: That's correct.

MR. STEIN: All right. Thank you.

Any other comments or questions?

This is on the general report.

MR. PELOQUIN: I have a question.

MR. STEIN: Mr. Peloquin.

MR. PELOQUIN: There is one comment in the report that nearly all pollution in the Mount Hope Bay area originates in Massachusetts. And also I noted in Mr. Green's comments he mentioned that 80 percent of the pollution originates in Massachusetts, which leads me to believe that 20 percent originates in Rhode Island.

In looking over the list of municipal and industrial sources I find nothing listed for Rhode Island. Is there pollution originating in Rhode Island also going into Mount Hope Bay?

MR. STEIN: Remember in these questions and answers we want the audience to hear.

Go on.

MR. KNUDSON: In regard to this, we are not aware of any domestic sewage being discharged to the waters of Mount Hope Bay. However, as pointed out in the report, there are some problems with the Tiverton oil terminal area, and we do have an occasional oil spill in the area, and there is some degradation in Mount Hope Bay from this.

MR. PELOQUIN: From the oil?

MR. KNUDSON: From the oil. There may be sources of pollution in Rhode Island that we are not aware of. But this is why we said over 90 percent of the pollution problems occur in Massachusetts.

MR. PELOQUIN: I gather from your statement that this is not a continuous thing but an occasional situation?

MR. KNUDSON: That's correct.

MR. SHEA: Wasn't the percentage 80 percent that you said came out of Massachusetts?

MR. KNUDSON: We have in our report 90 percent. Mr. Green said 80 percent.

MR. SHEA: You had 90?

MR. KNUDSON: We had 90.

MR. SHEA: You wouldn't think an occasional oil spill -- I think you listed 13 over a period of 2 or 3 years -- would constitute even 10 percent. In fact, it isn't --

MR. KNUDSON: I don't want to judge.

MR. STEIN: Can you speak up? They are having difficulty in hearing.

MR. SHEA: Well, I assume that when you talk of 90 percent coming from Massachusetts-- I'm not trying to damn Massachusetts any more than they are being damned, but at the same time I don't want to accept 10 percent of the pollution problem in Mount Hope Bay when there are no Rhode Island sources of either municipal pollution or industrial pollution.

MR. KNUDSON: We said over 90 percent. We didn't want to --

MR. STEIN: I think these numbers may be getting into problems. Let's see if I can state this as I have heard the report without numbers.

In your report -- and we haven't heard from the others -- so far we have attributed all continuing significant sources of pollution to Mount Hope Bay as coming from Massachusetts. There may be some occasional sporadic oil spills that may emanate from Rhode Island. Is that a fair statement?

MR. KNUDSON: That's correct.

MR. STEIN: Okay. I think we might be well advised to stay away from the numbers. That is the way I understand this statement.

MR. PAHREN: Maybe this will clarify it, Mr. Stein. What Mr. Knudson said in his report was that over 90 percent of the drainage area is located -- not that it's 90 percent of the pollution.

MR. SHEA: At least.

MR. PAHREN: I don't think he made any statement about the percentage of pollution in Massachusetts and Rhode Island.

MR. SHEA: Somehow or other an 80 percent number got in the record.

MR. STEIN: Let me say again I think we would be well advised, on the basis of at least the Federal report, to stay away from percentage numbers.

MR. SHEA: I'll go along with that.

MR. STEIN: Thank you.

MR. PELOQUIN: I have another question, Mr. Chairman. You make reference to the various thermal facilities in the bay. Have any data been developed to indicate the degree of temperature increase attributable to the discharges? You indicate 90-degree temperatures in some waters. Is there any data available to indicate the degree of increase directly attributable to the thermal discharges?

MR. KNUDSON: We have some information available from our studies, the State studies, the studies conducted by consulting companies for New England Power, and others, that relate to the problem of thermal discharges. I don't think I could-- A large number of our staff is working on this, and I don't have personal knowledge of the total situation. I just know that there are a lot of people both in the State government and in the Federal Government working on this problem.

I don't know if this answers your question satisfactorily or not.

MR. PELOQUIN: I think I would like to get, if it is available, the degree of temperature rise attributable to the discharges, if it is available, after the conference or at any time.

MR. STEIN: Do you know if that is available? Do any members of your staff know?

MR. KNUDSON: Mike Kemp, is that available?

STATEMENT OF

WILLIAM MICHAEL KEMP

SANITARY ENGINEER

ENVIRONMENTAL PROTECTION AGENCY, REGION I

NEEDHAM, MASSACHUSETTS

MR. KEMP: My name is Michael Kemp. I'm with the EPA.

There is a limited amount of temperature data available -- very sparse. And from this we have extrapolated some indications as to temperature increases in the Mount Hope Bay since the initial operation of the powerplant.

This data is not conclusive by any means, but it does indicate that there has been a temperature rise since 1959, which is the date that we have our original data.

MR. STEIN: I have two questions. One, how long will it take you to make that available to the conferees?

MR. KEMP: Some of it is available, is actually in the report.

MR. STEIN: Yes. Well, how long will it take you to make it available completely to the conferees?

MR. KEMP: A matter of days I suppose.

MR. STEIN: All right. Well, can they have it in their hands by the end of the week?

MR. KEMP: I imagine so.

MR. STEIN: All right. Well, let's take that as a commitment.

Now let's ask, while you are here, do you have any judgment of that temperature rise on the basis of your limited data? Or don't you care to say?

MR. KEMP: Well, I would say that there has been a temperature rise on the order of, say, 1 to 3 degrees Fahrenheit in the bay.

MR. STEIN: Over the whole bay?

MR. KEMP: Right.

MR. STEIN: All right. Any other questions?

MR. KEMP: This is during the summer. Excuse me.

MR. STEIN: Right.

MR. KNUDSON: One comment, Mr. Stein.

MR. STEIN: Yes.

MR. KNUDSON: Our National Marine Water Quality Laboratory under Dr. Tarzwell's direction is working on this problem, and he would be available to make some comments to Mr. Peloquin on the degree rise. His staff have done some studies.

MR. PELOQUIN: Thank you.

MR. STEIN: Are there any other comments or questions on Mr. Knudson's presentation?

MR. McMAHON: Mr. Chairman, although the Commonwealth conferees originally planned to ask detailed questions on the report, and primarily on the summary and recommendations, in view of the fact that we will be presenting our own 16 recommendations this afternoon I think it would appear purposeless at the present time.

However, we would like to reserve our rights to recall Mr. Knudson if at all necessary.

MR. STEIN: Oh, yes. That will be done. You will be available this afternoon, won't you?

MR. KNUDSON: Yes, sir.

MR. STEIN: Are there any other comments or questions?

(No response.)

If not, I would suggest that we recess for lunch. Let's recess and be back promptly in an hour and a quarter. That's quarter after 1 o'clock.

(Whereupon, at 11:58 a.m., the conference was recessed, to be reconvened at 1:15 p.m., this date.)

AFTERNOON SESSION

1:30 p.m.

MR. STEIN: Let's reconvene.

Are there any further questions on the Federal report?

(No response.)

If not, Mr. Pahren, will you continue?

MR. PAHREN: The next Federal representative that I would like to call upon will be Mr. Darrell Schwalm, who is the Regional Shellfish Consultant with the Food and Drug Administration.

STATEMENT OF
DARRELL J. SCHWALM
REGIONAL SHELLFISH CONSULTANT
FOOD AND DRUG ADMINISTRATION, REGION I
U. S. PUBLIC HEALTH SERVICE
BOSTON, MASSACHUSETTS

MR. SCHWALM: Mr. Chairman, I have a prepared statement which I would like to read. In addition, I would like the National Shellfish Sanitation Program Manual of Operations, Part I, Sanitation in Shellfish Growing Areas, included in the official record.

MR. STEIN: That will be included as an exhibit.

(The above-mentioned exhibit is on file at

Headquarters, Environmental Protection Agency, Washington, D. C., and Region I, Boston, Massachusetts.)

MR. SCHWALM: My name is Darrell Schwalm. I am a Regional Shellfish Consultant with the Food and Drug Administration, Region I, U. S. Public Health Service. My statement of interest in this conference is made within the framework of the National Shellfish Sanitation Program (NSSP), a consumer protection-oriented program administered jointly by the States and the Public Health Service, Food and Drug Administration.

The Food and Drug Administration is directly interested in the pollution profiles of Mount Hope Bay and is vitally concerned that the naturally available shellfish growing waters in the bay meet the criteria for the harvesting of shellfish for human consumption.

In this connection, the Food and Drug Administration is pleased to support any recommendations of the Environmental Protection Agency that will upgrade the water quality in Mount Hope Bay, and especially those recommendations which, if implemented, will protect and allow the harvesting of safe shellfish.

The Federal Government has been active in the field of shellfish sanitation since 1925 when an extensive outbreak of typhoid fever attributed to the consumption of oysters taken from polluted waters occurred. The State shellfish control agencies and the shellfish industry at that time requested the Public Health Service to aid them in developing a program which would assure safe shellfish for the consuming public.

Minimum standards were developed for adoption by all shellfish producing States, and since that date the standards have been revised and updated several times.

The current edition of the National Shellfish Sanitation Program Manual of Operations, dated 1965, has three parts. Part I of the manual provides detailed criteria for surveying and classifying shellfish waters. Briefly stated, surveys of shellfish growing areas must provide documentation of all sources of pollution and an evaluation of their influence under the most unfavorable hydrographic and pollution conditions that may exist for the area surveyed. The States of Massachusetts and Rhode Island classify their shellfish waters according to this manual.

Technical Considerations:

The production of safe shellfish (here I am including oysters, clams, and mussels) requires extensive control measures because of their unusual potential as vectors for the transmission of disease to man. This unusual potential can be attributed to three factors:

A. The environmental growth tolerances of shellfish are such that they ordinarily grow only in estuaries in which there is an admixture of fresh and salt water. These are also areas most subject to pollution with both industrial and municipal wastes.

B. Shellfish are filter feeders. In the process of feeding they pump large quantities of water across their gill systems. Particulate materials and dissolved substances are removed and concentrated to levels above that of the overlying waters. Quahogs during periods of active feeding concentrate bacteria to a level 2.5 to 6.0 times that of the overlying waters. The concentration factor for metals, industrial wastes, or pesticides is much greater.

C. Shellfish are frequently consumed raw or with little cooking. The entire animal is usually eaten.

It has been demonstrated many times that these factors can combine to transmit human diseases. Typhoid fever has been historically linked with polluted shellfish, but in recent years infectious hepatitis has presented the major threat.

There have been no recognized instances in the United States in which shellfish have carried a sufficient concentration of industrial wastes to cause acute illness. However, in Japan 83 cases of severe mercury poisoning were attributed to waste discharged from a plastics manufacturing plant.

Hydrocarbons, various heavy metals, and pesticides have also been identified in shellfish.

Use of shellfish as food then demands that great care be exercised to assure that harvest or culture areas are free of hazardous pollutants. By similar reasoning, great care must be exercised to prevent the harvesting of shellfish for direct marketing from any areas which are not of satisfactory quality. These two elements are, in fact, the underlying principles of the National Shellfish Sanitation Program.

Shellfish Growing Area Classifications:

The detailed technical criteria for the classification of shellfish growing waters is set forth in Part I of the National Shellfish Sanitation Program Manual. A copy of the current edition of Part I is provided as part of this statement. In brief, the types of classifications are as follows:

A. Approved -- Areas approved for the direct market harvesting of shellfish. Such areas must be free of hazardous concentrations of fecal materials, industrial wastes, radionuclides, and naturally occurring marine toxins. Total coliform levels must not exceed a median MPN of 70/100 ml, water.

B. Conditionally Approved -- Areas meeting the same criteria as "Approved" except that their suitability is contingent on the sustained, effective functioning of sewage treatment facilities (or other variable sources of pollution) discharging to such areas.

C. Restricted o. moderately polluted -- Shellfish may be taken from these areas only under close supervision by health officials and only for purification in an approved depuration plant or by relaying before they can be released for the market. The total coliform median MPN for restricted areas is between 70/100 ml and 700/100 ml water.

D. Prohibited or grossly polluted -- Shellfish may be taken from these areas only for the purpose of transplanting seed stock or relaying mature stock to "Approved" growing areas under special written permit from health officials. The total coliform median MPN for prohibited areas exceeds 700/100 ml water.

Shellfish as a Natural Resource:

The estuaries and their biological populations have long been recognized as a valuable natural resource. In fact, colonial statutes hopefully designed to assure the wise use of this resource antedate most other conservation measures in the United States. Unfortunately, this concept passed into a period of eclipse -- at least insofar as water quality was concerned -- during the very period in which degradation of estuarine water quality was most prevalent. It now shows signs of reemerging.

The National Shellfish Sanitation Program as established in 1925 had a twofold base: (1) safe use of a resource, and (2) conservation of a renewable natural resource.

This dual concept was reaffirmed by action taken at the 1964 National Shellfish Sanitation Workshop which adopted a positive statement to the effect that the estuaries represented a valuable manageable natural resource -- similar in many respects to forests, land, air, or freshwater -- and that shellfish culture represents a beneficial use of this resource.

It does not, of course, follow that shellfish culture is the only beneficial use or that it is the most important beneficial use. But clearly, and for several hundred years of our history, shellfish culture has provided a source of high quality protein from our estuaries and their tributary streams.

Shellfish Sanitation in Massachusetts:

In Massachusetts, the State Department of Public Health, Division of Environmental Health, is responsible for surveying and classifying shellfish growing areas. At the present time, all of Mount Hope Bay except a small area at the mouth of the Cole River is closed to the direct market harvesting of shellfish. This closure has been in effect since at least 1937.

The source of pollution affecting Mount Hope Bay originating from Massachusetts as described in the EPA report on pollution of Mount Hope Bay includes municipal wastes, industrial wastes, combined sewer overflows, and heated effluents. The EPA report lists 12 waste treatment plants, several tanning, textile and leather manufacturing, metal plating, and chemical manufacturing industries, four municipalities and a State-operated institution with combined sewer systems, and six thermal electric generating stations.

Most important from a shellfish sanitation standpoint are the waste treatment plants and combined sewer systems that discharge pathogenic microorganisms into the water and the industrial sources and combined sewer systems that discharge heavy metals and other toxic chemicals into the water.

Shellfish Sanitation in Rhode Island:

In Rhode Island, the State Department of Health, Division of Water Pollution Control, is responsible for surveying and classifying shellfish growing areas. At the present time, all of the Rhode Island portion of Mount Hope Bay except for the Kickamuit River is closed to direct market harvesting of shellfish.

Sources of pollution affecting Mount Hope Bay originating from Rhode Island as described by the EPA are essentially limited to oil terminals in Tiverton, Rhode Island. Oil pollution resulting from oil spills and discharges from waste treatment facilities adds an additional shellfish sanitation consideration.

Increasing Shellfish Production:

Even though there are numerous sources of pollution affecting Mount Hope Bay, limited shellfish harvesting is presently possible through relaying. Relaying involves transplanting shellfish from polluted areas to clean areas, and is possible only when shellfish are contaminated with biological pollutants. Shellfish contaminated by chemicals cannot be purified.

Once relayed to clean waters, the shellfish naturally cleanse themselves of the biological pollutants. After a specified time period, relayed shellfish can be harvested for direct market sale. However, relaying operations are costly and are usually restricted to a few large commercial dealers.

Shellfish from polluted areas in Mount Hope Bay in Massachusetts are relayed to the Cole River "Approved" area. In Rhode Island, shellfish from polluted areas are relayed outside of Mount Hope Bay.

If it is determined that one goal of the pollution abatement program for Mount Hope Bay should be to open up additional shellfish growing areas for commercial and/or recreational harvesting, certain important public health hazards must be considered.

The first consideration is the biological contamination of shellfish by pathogenic microorganisms from waste treatment facilities and combined sewer system discharges. Such contamination must be abated in and near areas designated for shellfish harvesting.

In this context, Food and Drug Administration fully endorses the Environmental Protection Agency's recommendations for at least secondary treatment of all domestic waste discharges and for effective year-around chlorination.

However, it is recommended that in the design, construction, and operation of all sewage treatment facilities discharging into Mount Hope Bay the Food and Drug Administration Technical Bulletin on "Guidelines for Sewer System and Sewage Treatment Plants for Protection of Shellfish Growing Waters" be utilized. These guidelines have been submitted to EPA to supplement the Water Quality Office Federal Guidelines "Design, Operation and Maintenance of Wastewater Treatment Facilities."

Furthermore, the abatement program should establish effective and consistently attainable performance standards for all sewage treatment facilities to permit implementation of a dependable "Conditionally Approved" area management program by State control authorities (see paragraph 4, section C, part I, NSSP Manual of Operations).

That treatment facilities may provide better than the established degree of treatment most of the time is an unacceptable risk in any "Approved" area control program. Reliable operational and performance standards are imperative if any part of Mount Hope Bay is to be safely restored to shellfish production.

The second consideration is the contamination of shellfish by various heavy metals and other toxic chemicals. The Food and Drug Administration toxicological guideline for mercury contamination of shellfish is 0.50 ppm.

Toxicological guidelines for other heavy metals in shellfish are still being developed.

Nevertheless, we agree that discharges of heavy metals which create residues in the environment and in shellfish in excess of existing background levels found in the sediments and in shellfish in nonindustrial areas should be reduced or eliminated.

Table 1 defines what the FDA and the Northeast Shellfish Sanitation Association (NESSA) consider to be (1) existing average background levels in shellfish and (2) levels that represent a significant increase over existing average background levels in shellfish. These levels apply only to shellfish in the Northeast Atlantic coastal areas from New Jersey to Maine.

The levels have been developed from several hundred samples collected and analyzed over a period of several years by the Food and Drug Administration, by the Narragansett Water Hygiene Laboratory which is now part of EPA, and by the States.

In addition, discharges of other toxic chemicals should also be reduced or eliminated as recommended by EPA.

Table 1. Heavy Metal Residues in Shellfish in Northeast Atlantic Coastal Shellfish Growing Areas.

Heavy Metal (1)		Oyster	Hard Shell Clam	Soft Shell Clam
Cadmium	Ave. Conc.	1.77	0.21	0.20
	Ave. + 1 St'd. Dev.	3.41	0.39	0.44
Lead	Ave. Conc.	0.64	1.95	2.11
	Ave. + 1 St'd. Dev.	1.48	3.87	4.61
Chromium	Ave. Conc.	0.53	0.35	2.26
	Ave. + 1 St'd. Dev.	1.63	0.88	4.37
Zinc	Ave. Conc.	1162	40	19.1
	Ave. + 1 St'd. Dev.	1985	62	29.7
Copper	Ave. Conc.	77	5.6	8.9
	Ave. + 1 St'd. Dev.	175	9.5	24.0

(1) Concentrations in parts per million

The final consideration is the contamination of shellfish by hydrocarbons resulting from oil spills, sewage treatment plant discharges, and combined sewer system overflows.

Although this type of contamination is well documented, again, there are presently no toxicological guidelines for hydrocarbon levels in shellfish. Nevertheless, we concur that all discharges of hydrocarbons should be reduced or eliminated as recommended by EPA.

Conclusion:

Shellfish resources in Mount Hope Bay are considered to be an economically valuable and important food resource. At the present time there are approximately 105 certified shellfish dealers in Massachusetts and 35 certified shellfish dealers in Rhode Island.

The NSSP is vitally interested that the naturally available shellfish growing areas in Mount Hope Bay meet the public health criteria for harvesting shellfish for human consumption. These public health criteria and considerations are based on the fact that shellfish naturally concentrate both biological and chemical pollutants and that normally the entire shellfish organism is eaten either raw or partially cooked.

The National Shellfish Sanitation Program recommends that a pollution abatement program for Mount Hope Bay include consideration for reclamation of both commercial and recreational shellfish growing areas in Mount Hope Bay. We fully endorse EPA recommendations concerning control and/or elimination of both municipal and industrial pollutants which presently render Mount Hope Bay unfit for direct market harvesting of shellfish.

MR. STEIN: Thank you.

Are there any questions or comments?

MR. PAHREN: I have one question. Mr. Schwalm, did FDA distribute this Technical Bulletin, "Guidelines for Sewer System and Sewage Treatment Plants for Protection of Shellfish Growing Waters," to various design engineers in various States so that they can utilize this information at the earliest possible time?

MR. SCHWALM: I don't believe that we directly did this. By including it as a technical bulletin to your guidelines we felt -- I think we feel -- that --

MR. PAHREN: That it would reach the proper hands?

MR. SCHWALM: -- it would reach the consulting engineers.

As I understand, you are putting forth special efforts now to get right to the consulting engineers in the towns with your guidelines and what not.

MR. PELOQUIN: Mr. Schwalm, just for my own clarification, you say that there is no purification other than biological purification as far as shellfish. In other words, any heavy metals that the shellfish ingest remain within the system, are not purified?

MR. SCHWALM: That is correct. Pesticides and, to our knowledge, hydrocarbons also.

MR. PELOQUIN: You say you are now in the process of establishing limits on these?

MR. SCHWALM: That's correct.

MR. PELOQUIN: Are there any data available in this Japanese situation which would provide correlation to indicate possible limits?

MR. SCHWALM: In terms of what levels they found in the environment which contributed to the disease or to the --

MR. PELOQUIN: Yes.

MR. SCHWALM: I would imagine that this data would be available. I have no personal knowledge of it, however.

MR. PELOQUIN: One more question. I gather from your statement that if secondary treatment facilities are provided in accordance with your guidelines that the areas of Mount Hope Bay would be opened to the conditional level only and not as an approved area. Do you have any estimate as to how much of the area would be opened for the harvesting of shellfish?

MR. SCHWALM: It is correct that we feel that because of the sewage treatment plants, a large number of them, and the type of area it is, a conditionally approved area would be the only type of area which would be manageable in this situation.

We have not done any studies. I don't know if the State has. I don't have any knowledge of what work they have done. But we have not done any studies to give you an estimate of how many acres, for example, could be opened up if secondary treatment and year-around effective chlorination and construction of the treatment facilities by our guidelines were provided.

If this were realized, we could not give you an estimate at this time of acres or anything like that.

MR. PELOQUIN: But would the areas be opened if stormwater overflows still existed in the area?

MR. SCHWALM: Stormwater overflows in that area would present another variable source of pollution. We have a situation in Narragansett Bay; Providence and the surrounding communities have stormwater overflows. We have a conditionally approved area management program for portions of the upper Narragansett Bay based on overflows from these combined sewer systems so that this type of management program with the existence of stormwater overflows is possible, yes. We have done that in Narragansett Bay.

MR. PELOQUIN: Thank you.

MR. STEIN: Are there any other questions or comments?

(No response.)

It seems to me that whenever we go into one of these shellfish cases where we have some municipal discharges and we are dealing with a sewage treatment plant, unless you build a large pipe outside the receiving waters, the most you are ever going to receive is a conditionally approved area.

MR. SCHWALM: That is true. You would have to pipe it into the ocean.

MR. STEIN: We recognized that when we called the conference. The only other alternative is not to put any waste, treated or untreated, from municipal sources into Narragansett Bay -- and usually that is not contemplated.

I think this is the question we are always faced with in a pollution control case. The way the Food and Drug Administration operates, if there are treated municipal wastes, the most you can get is a conditionally approved area.

The only solution to that is to wave a magic wand and abolish the city or else build a pipe out to the ocean or somewhere else where no effluent would go into the bay.

I think this is a fact in a shellfish improvement program we are going to increasingly have to expect, and if we open these areas that are now closed, by and large, they will be conditionally approved areas except in the rarest of situations.

So that's really what the program is all about.

MR. SCHWALM: That's correct. Any time you have a sewage treatment plant, no matter how well constructed and maintained and operated, there is always the potential that it could break down.

MR. STEIN: Of course.

MR. SCHWALM: And if a conditionally approved area is managed such that, if a sewage treatment plant or a source of pollution did break down, the mechanism already exists to immediately close that area -- this includes constant surveillance of these sources -- the administrative procedures have been established and shown to work to immediately close down the area.

In an approved area where these sources are a large distance away, then we don't have to take that type of measure.

However, if you have a plant that is operating well and is maintained properly, there is no reason to expect that the thing might break down more than a couple of times a year. So, in effect, the area could be opened the vast majority of the time.

It is just a requirement on the State to exercise better surveillance and management over the possibility of a breakdown.

MR. STEIN: Any other comments or questions?

MR. PELOQUIN: I am very glad that these comments were made, Mr. Chairman, because I always have the fear when we get into this area that we may be conveying to the public that by building secondary treatment plants we are going to solve all the problems in the shellfish areas which will automatically become approved open areas.

MR. STEIN: They will be substantially opened.

I didn't want to get into another sensitive area, but we always have these problems when you are dealing with a source such as this -- for example, where a lot of these communities use a surface water supply. All you have got between your water tap and that water are men and machines, and a breakdown is possible.

I think what Food and Drug Administration is saying -- if they are going to open an area to shellfish harvesting that has treatment, no matter how good that treatment is -- if all that is standing between having that shellfish area clean or having it contaminated are men and machines -- and we know that men and machines break down -- they want some kind of system so that if things do break down they can say, "No more harvesting of shellfish until it clear up." I think this is the issue again that we have to get to, and this is a fundamental one.

I agree if you are going to have the large cities, and we are going to use treatment for the wastes of those large cities, and we are going to put the effluent from those large cities into areas such as Narragansett Bay or Mount Hope Bay or any of the islands within the barrier islands -- and on the East Coast you can take it from this area way down to Florida -- and behind the barrier islands, as long as we have any kind of sewage pipe going into these areas it is impossible under the regulations for these areas to be any more than conditionally approved.

If you want to change this, it seems to me that you are going to have to go into a kind of program to get big pipes with effluent going way out into the ocean.

MR. SCHWALM: That's right -- or build big tunnels under the ground.

MR. STEIN: Yes. That's right. And that's going to be very, very expensive.

I think Mr. Peloquin raises a point. The notion is when this enforcement action is stated, you want to know what the objectives are and what we possibly can get if everything goes right, because you can't get more than that.

Are there any other comments or questions?

(No response.)

If not, thank you very much.

Mr. Pahren.

MR. PAHREN: I have no other cards indicating that Federal officials want to make a statement.

Is there any Federal Agency that wants to make a statement that has not been heard so far?

(No response.)

If not, I will turn it back to you, Mr. Chairman.

MR. STEIN: All right. We will at this time call on the interstate agency and the State agencies. First, the interstate agency. Mr. Peloquin.

MR. PELOQUIN: I have no prepared statement, Mr. Chairman.

I have gone over a good portion of the report and the conclusions and recommendations. I find them in part quite horrendous. However, I think in fairness to the States that I would like to hear the comments from the States, and possibly we will have additional comments later on.

MR. STEIN: You found them what did you say?

MR. PELOQUIN: Horrendous. (Laughter)

MR. STEIN: Horrendous? That's a good start. (Laughter)

May we hear from Rhode Island? Mr. Shea.

MR. SHEA: I am going to ask Mr. Maine, Chief of the Division of Water Pollution Control, to read a statement that has been prepared for Rhode Island.

STATEMENT OF

CARLETON A. MAINE

CHIEF, DIVISION OF WATER SUPPLY AND POLLUTION CONTROL

RHODE ISLAND DEPARTMENT OF HEALTH

PROVIDENCE, RHODE ISLAND

MR. MAINE: Mr. Chairman, my name is Carleton A. Maine, Chief, Division of Water Supply and Pollution Control, Rhode Island Department of Health.

Mount Hope Bay in Rhode Island is a valuable natural resource. Every effort should be made to realize its fullest potential. Portions of the bay are used for bathing. The entire bay is suitable for recreation and boating.

Mount Hope Bay south of a line from Common Fence Point to Mount Hope Point was closed to the taking of shellfish in 1949 because of the concentration of bacteria found exceeding standards for shellfish waters. The northern section of the bay was closed prior to 1940.

In December 1955, the bay waters were classified by the New England Water Pollution Control Commission, on the basis of the highest use and the water quality that could be achieved through the adoption of the most practical treatment of all waste discharges originating on its watershed. The classification adopted was agreed to by the State of Massachusetts and the State of Rhode Island. It is shown in a report made to the Federal Government.

The northeast section generally of the Rhode Island portion of the bay in the vicinity of the Fall River waste treatment plant outfall was found to be of a quality falling into Class D because of a deficiency of oxygen in these waters.

It was proposed to elevate the quality of these waters to Class C, making the waters then suitable to the propagation of fish indigenous to the area.

An adjacent area including the Spar Island area was found to be in a Class C condition. It was proposed to elevate these waters to Class B (suitable for bathing).

The remainder of the bay found to be in a Class B condition would be elevated to Class A (suitable for harvesting of shellfish).

In 1967, to meet Federal requirements, the State of Rhode Island adopted water quality standards for these waters. They are the same as those adopted by the New England Interstate Water Pollution Control Commission in 1955. The standards were accepted and approved by the Federal Government.

Most important to Rhode Island is the improvement of the water quality of Mount Hope Bay in the vicinity of Touisset Point, the areas adjacent to the shores of Bristol, and the area along the shores of Portsmouth. These waters will be improved so that shellfish may be harvested from the areas for human consumption. It is recommended that the most practical means of treatment be adopted at all sources of pollution to achieve this water quality.

The town of Tiverton on the east shore of Mount Hope Bay is developing at a rate that it will make it necessary to install municipal sewers for collecting the wastes from residential and commercial developments in the near future. It is recommended that when such municipal sewers are installed in the town of Tiverton, provision be made for discharging the collected waste to the Fall River waste treatment facilities for treatment.

Thank you.

MR. STEIN: Thank you.

Are there any comments or questions?

(No response.)

MR. SHEA: Mr. William E. Barbour of Rhode Island has asked for an opportunity to speak.

MR. STEIN: While he is coming up, it occurs to me I don't know whether Rhode Island is in an enviable or an unenviable position. But it seems that there are not any substantial sources of pollution for this area listed in Rhode Island. Yet if we take some of these reports, Mr. Schwalm's report in particular, we find the situation as far as shellfish harvesting is pretty bad.

Reading from Mr. Schwalm's report, I find it says, "At the present time, all of the Rhode Island portion of Mount Hope Bay except for the Kickamuit River is closed to direct market harvesting of shellfish."

Now, if it is closed, it must mean it is closed because of an official action.

MR. SHEA: By the State of Rhode Island.

MR. STEIN: That's right. And if the sources aren't in Rhode Island, they must be somewhere.

All right. Go ahead.

MR. SHEA: Mr. William E. Barbour of Bristol, Rhode Island has asked for an opportunity to make a statement. Is he here?

(No response.)

I guess not, Mr. Chairman.

MR. STEIN: Next we have Massachusetts. There will be some other people to call on as we go along.

MR. McMAHON: Mr. Chairman, before I call on the first of the State speakers, I do have a memorandum to me from the Director of Marine Fisheries in the Commonwealth of Massachusetts, Frank Grice. Basically, the subject is: "Review of EPA's Report on 'Pollution of the Interstate Waters of Mount Hope Bay and its Tributary Basins.'"

The division has reviewed the above-titled report in reference to marine fisheries. We have found several significant errors in the data dealing with shellfisheries. EPA utilized data from our files in compiling this report; however, they apparently expanded upon the information we gave them and in doing so made the following errors.

I don't feel that I have to read these. I would like this to go into the record. There are some 16 errors in the estimation of Mr. Grice, who is the Director of Marine

Fisheries in Massachusetts.

MR. STEIN: Without objection, that will appear in the record as if read.

(The statement of errors referred to follows.)

1. On page vi, recommendation 3, last line, "$2,000,000" should read $1,600,000.

2. Page 64, last paragraph, line 5, "11 to 36 acres" should read 9 to 17 acres.

3. Page 65, first paragraph, line 7, "$21,600 bu." should read 2,175 bu.

4. Page 65, first paragraph, line 9, "115 acres" should read 49 acres.

5. Page 65, first paragraph, line 9, "$237,500" should read $19,575.

6. Page 65, first paragraph, line 10, a sentence should be added at the end of the paragraph, "There were also 3,100 bu. of seed oysters on 49 acres of productive bottom."

7. Page 65, second paragraph, line 7, "from 4 to 22 clams per sq. ft." should read 1 to 22 clams per sq. ft.

8. Page 66, first paragraph, line 1, "270 acres" should read 277 acres.

9. Page 66, first paragraph, line 2, "202,700 bu." should read 105,204 bu.

10. Page 66, first paragraph, line 3, "$1,013,200" should read $586,881.

11. Page 66, second paragraph, line 4, "1 to 4 per sq. ft." should read 0 to 4 per sq. ft.

12. Page 66, second paragraph, line 7, "69 acres" should read 61 acres.

13. Page 66, second paragraph, line 7, "24,300 bu." should read 13,111 bu.

14. Page 66, second paragraph, line 8, "$107,600" should read $70,734.

15. Page 66, paragraph 3 should be deleted and the following should be substituted: "In all, the estimated Massachusetts standing crop value of marketable shellfish in closed and in areas suitable for depuration totals $677,190 representing about 4,000 acres of shellfish grounds."

16. Table 11 should be presented to show corrections noted above in the text.

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MR. McMAHON: At this time I would like to call on Miss Gloria Ann Fry, who is a junior sanitary engineer in the Enforcement Section of the Division of Water

Pollution Control.

Miss Fry has a brief statement, after which she will submit a complete, up-to-date enforcement record of the Commonwealth of Massachusetts within the subject area.

Miss Fry.

STATEMENT OF
GLORIA ANN FRY
JUNIOR SANITARY ENGINEER
DIVISION OF WATER POLLUTION CONTROL
COMMONWEALTH OF MASSACHUSETTS
BOSTON, MASSACHUSETTS

MISS FRY: My name is Gloria Ann Fry. I work for the Enforcement Section of the Massachusetts Division of Water Pollution Control, and I would like to briefly outline the Massachusetts implementation program in the Mount Hope Bay watershed area.

On page 6 of the conference report, conclusion No. 5 reads, and I quote, "While State programs are securing abatement, there are waste sources in the conference area in violation of federally-approved implementation plans and schedules. In addition, there are a number of waste sources in the conference area which are not on federally-approved implementation schedules." The data contained in these tables is not of the utmost accuracy, as I would like to briefly point out.

These tables, purportedly depicting the Commonwealth's implementation program for the Mount Hope Bay watershed area, contain a great many errors and do not reflect the high degree of cooperation and compliance with the State program on the part of the municipalities and industries in the area.

In order that the conference might have the most accurate information on the State program, I have prepared another up-to-date listing of the State implementation schedule which I am now submitting for the record.

I would like to briefly summarize the progress being made by the municipalities and industries in complying with this program.

There are 12 municipal and 46 industrial projects currently on schedules to abate their respective sources of pollution. Of the 12 municipal projects, 10 have submitted engineering reports, five have submitted final plans, three projects are under construction, and the town of Somerset has recently completed construction of a new secondary treatment facility.

Of the 46 industries on schedules, 32 have submitted engineering reports, 21 have submitted final plans, five projects are currently under construction, 18 have completed construction and are no longer polluting, and two industries have gone out of business. Thus, over a third of these sources of pollution have been eliminated.

At this time, I would like to comment on those 16 sources listed in Tables 3 and 4 as not being in compliance with federally-approved implementation schedules.

For nine of the 16, the Federal and State schedules are the same. Of the nine, five are in compliance with the Federal dates. Of the remaining four, two are under construction, one will shortly begin construction of pretreatment facilities, and one has considerably reduced its volume of wastes through inplant piping changes.

Following a determination of the need for pretreatment, this industry will connect to the municipal system.

For the remaining seven sources, the State implementation dates differ from the federally-approved dates. Four of these sources are in compliance with the division's program. Of the remaining three, one will begin construction of its facilities in the near future, and enforcement action against the remaining two industries will be underway shortly.

Unfortunately, there is no differentiation made in the status column between those municipalities and industries who have done little or nothing toward correcting their specific problems and those who, frequently through no fault of their own. have fallen slightly behind schedule. To us this is an unwarranted "black eye" for a town or industry which has done its utmost to cooperate with the division's pollution abatement program.

The remainder of the alleged sources of pollution in Tables 3 and 4 are listed as "Not on Implementation - Compliance Status Not Known." All 50 of these alleged sources have been investigated by personnel of the Division. One of the sources is out of business, and 17 of the sources are not discharging and are not polluting. Twelve of the sources were found to be polluting and have been, or will shortly be, issued schedules by the division. As in the past, these schedules will be provided to Environmental Protection Agency personnel as they become available.

The remaining 20 sources were found to be minor discharges and are being handled by the division's regional office in cooperation with local boards of health and municipal officials and the regional office of the State Department of Public Health.

As these figures adequately demonstrate, a great deal of work has been and will be done in the next few years. The progress to date has been largely voluntary and indicates a great cooperative effort on the part of all concerned. The industries and municipalities are justifiably taking great pride in their accomplishments. And to issue a publication such as this conference report, containing so many errors and erroneous implications, does not foster the cooperative attitude so necessary for achieving our mutual goal of pollution abatement.

If you have any specific questions regarding any of the alleged sources of pollution in Tables 3 and 4, I or other division personnel will be happy to answer them.

Thank you.

MR. STEIN: Do you want to submit this table for the record?

MR. McMAHON: Yes. The schedule should be submitted for the record since this is the most up-to-date information.

MR. STEIN: This will be included in the record at this point as if read.

(The table referred to follows.)

MASSACHUSETTS IMPLEMENTATION SCHEDULE

TAUNTON RIVER BASIN

LOCATION AND NAME	ENGINEERING REPORT	FINAL PLANS	START CONSTRUCTION	COMPLETE CONSTRUCTION	REMARKS
Abington					
Municipal	Complete	5/72	7/72	7/73	
Bridgewater					
George O. Jenkins	Complete	Complete	Complete	Complete	No Longer Polluting
Bridgewater Sand & Stone	Complete	Complete	Complete	Complete	No Longer Polluting
Stiles & Hart Brick	Complete	Complete	Complete	Complete	No Longer Polluting
Brockton					
Municipal	3/31/72	5/31/73	7/31/73	9/30/74	Advanced treatment req'd - City conducting survey of industrial users
A & L Tannery	--	1/69	Complete	Complete	Tied into Municipal System
Churchill Supply Co., Inc.	--	Complete	Complete	Complete	Tied into Municipal System
Drew Tanning Co.	Complete	1/71	3/71	9/71	Engineer recently proposed process for complete recycling of wastes
Dighton					
Municipal	Complete	11/70	3/71	3/72	Report approved 6/71 - Funds to be voted at '72 ATM
I.C.I. America	Complete	2/72	5/72	3/73	
Easton					
Simpson Spring Co.	6/30/71	6/30/71	8/30/71	10/30/71	only discharge November throug March - lagoon adequate during summer-enforcement action bein considered

LOCATION AND NAME	ENGINEERING REPORT	FINAL PLANS	START CONSTRUCTION	COMPLETE CONSTRUCTION	REMARKS
Fall River					
Municipal	Complete	Complete	Complete	12/68	Stage I completed 6/70; Stage II due to complete 4/72
Aluminum Processing Corp.	Complete	Complete	Complete	Complete	tied into Municipal System (part of Kerr Mill complex)
Anodizing Co. of New England	Complete	Complete	11/70	12/71	dependent on City obtaining Federal grant for S. Watuppa sewer construction
Arkwright Finishing	Complete	Complete	Complete	12/71	Under Construction
Artcraft Fixtures (Div. of DeSoto, Inc.)	*Complete **	Complete 3/31/72	Complete 5/15/72	12/71* 12/31/72**	*partial treatment w/connection **full treatment w/discharge to river
Bristol Finishing Co.	Complete	12/71	2/72	7/72	
Elbe File & Binder	6/15/71	9/15/71	10/15/71	3/72	*cease and desist order issued 11/71 - to be enforced by Superior Court
Firestone Rubber & Latex Prod. Co.	Complete	Complete	1/71*	12/71*	*out of business
J & J Corrugated Box	--	Complete	Complete	Complete	tied into Municipal System
Industrial Trust (Kerr Mill Complex)	Complete	Complete	Complete	Complete	tied into Municipal System
Newport Finishing	Complete	Complete	Complete	Complete	tied into Municipal System
Pearl Laundry Co.	1/70*	9/70*	11/70*	12/71*	out of business
Providence Pile & Fabric	Complete	Complete	Complete	12/71	
Ross Matthews Corp.	8/71	11/71	1/72	7/72	enforcement action being considered
Spindle City Dye Works	Complete	12/71	2/72	7/72	
Sterling Pile Fabrics Corp.	Complete	Complete	9/30/71	1/72	final plans approved 10/71 (revisions necessary)on prior submissions

LOCATION AND NAME	ENGINEERING REPORT	FINAL PLANS	START CONSTRUCTION	COMPLETE CONSTRUCTION	REMARKS
Foxboro					
Municipal	Complete	1/72	3/72	4/73	part of Rumford Rr. Sewer District;report being prepared
Freetown					
Olin Thompson Plastics	Complete	Complete	Complete	12/71	waiting permission to tie into Municipal System
Hanson					
Ocean Spray Cranberry	10/71*	10/72*	2/73*	2/74*	*will move all production to Middleboro when latter's STP is enlarged
Mansfield					
Bay State Tap & Dye	12/67*	6/68*	8/68*	Complete*	*tied into Municipal System
Merckens Chocolate (Nabisco)	Complete	Complete	Complete	2/15/72	pretreatment-under construction
Middleborough					
Municipal	10/71	10/72	2/73	2/74	Joint treatment with Ocean Spra being studied
Middleboro Chemical Industries, Inc.	Complete	Complete	Complete	Complete	subsurface approved and inspected by Dept. of Public Health
Middleboro Plating Corp.	Complete	Complete	Complete	Complete	"subsurface" - batch treatment and lagoons
Plymouth Shoe	--	5/69*	6/69*	9/69*	*tied into Municipal System
Norton					
Municipal	--	--	--	--	No sources of pollution
Defiance Manufacturing	Complete	3/72	5/72	7/73	
Reliable Electroplating Inc.	Complete	Complete	Complete	Complete	Lagoon

LOCATION AND NAME	ENGINEERING REPORT	FINAL PLANS	START CONSTRUCTION	COMPLETE CONSTRUCTION	REMARKS
Somerset					
Municipal - Project #1	Complete	Complete	Complete	Complete	Secondary treatment w/chlorination
Project #2	Complete	Complete	Complete	9/70	Additional sewers under construction
New England Power	Complete	2/71	3/71	9/71	Under review
Parks Corporation	4/72	6/72	8/72	12/72	Order issued 12/2/71
Swansea					
Swan Finishing	3/72	3/72	7/72	7/73	Alternate II dates - have decided to build new plant in Fall River
Taunton					
Municipal	Complete	12/72	4/73	5/73	proposed secondary treatment - report being reviewed
East Taunton	Complete	Complete	Complete	9/68	Additional Sewers
Ansonia Mills	3/71*	3/72*	5/72*	Complete*	*Tied into Municipal System
Dyecraftsmen	Complete*	2/31/72	9/30/72	9/30/73	*Additional info. required before approved by WPC
Geilich Tanning Co.	Complete	3/72	5/72	5/73	
Harodite Finishing	Complete	7/31/72	9/72	9/73	
Haskon Inc.	Complete	--	--	Complete	Tied into Municipal System
New Jersey Rubber	3/71	3/72	5/72	5/73	Most of wastes being recycled - evaluating necessity of pretreatment
Ronco Enterprises	Complete	7/31/72	9/30/72	9/30/73	
Royce Aluminum	Complete	7/31/72	9/30/72	9/30/73	
Sheridan Silver Co.	Complete	7/31/72	9/30/72	9/30/73	report being reviewed by WPC
Synthetic Yarns	Complete	Complete	Complete	Complete	only sanitary wastes - tied into Municipal System

MR. STEIN: Are there any comments or questions?

MR. PELOQUIN: Mr. Chairman, I have one question. Miss Fry, on page 2 of your report you mention that one industry I believe has considerably reduced its volume through inplant changes.

MISS FRY: Yes.

MR. PELOQUIN: By this reduction will this bring about compliance? Or is further action required to achieve compliance?

MISS FRY: This industry is in the city of Taunton, and the city has been for the past year involved in an intensive industrial survey of all the industries in the city either connected or proposed for connection to the municipal system.

The industry will begin evaluation of its flow now that it has instituted these inplant changes, and if pretreatment is necessary it will be installed and the industry will connect to the municipal system.

MR. PELOQUIN: Thank you.

MR. STEIN: Are there any other comments or questions?

(No response.)

If not, thank you very much.

MR. McMAHON: The next person I would like to introduce is Mr. Donald R. Corey who is the Supervising Sanitary Engineer in charge of the oil pollution program of Massachusetts.

STATEMENT OF
DONALD R. COREY
SUPERVISING SANITARY ENGINEER
DIVISION OF WATER POLLUTION CONTROL
COMMONWEALTH OF MASSACHUSETTS
BOSTON, MASSACHUSETTS

MR. COREY: Thank you.

Mr. Chairman, conferees, ladies and gentlemen, my name is Donald Corey. I am Supervising Sanitary Engineer of the Massachusetts Division of Water Pollution Control. I would like to comment on two aspects of the enforcement conference report concerning dredging and oil pollution abatement.

First of all, on dredging, the question of disposal of contaminated dredged spoil material has previously been discussed on various occasions between representatives of this division, EPA, and the Corps of Engineers. We find that little progress has been made in resolving the problem.

In this enforcement conference discussion of dredging of the navigation channel to Fall River, the report fails to differentiate between maintenance dredging back down to 35 feet mean low water (MLW) and channel improvement dredging to deepen it to 40 feet MLW.

The dredged spoil material down to 35 feet unquestionably poses a problem in that it is polluted to varying degrees. However, the channel has silted in, and uncharted obstructions have been deposited in the channel so that there is reportedly less than 32 feet of water in places, causing a hazardous condition.

A tanker bound for North Fall River grounded on one such obstruction in the last year. Although no pollution resulted from that incident, the probability of a serious grounding accident persists, with potential loss of property and pollutional damage.

In order to eliminate the day-to-day hazard of grounding on uncharted obstacles in the channel and the pollution resulting therefrom, maintenance dredging back down to 35 feet is considered absolutely essential.

The dredging spoil material down to 35 feet undoubtedly consists largely of organic silt which exceeds Environmental Protection Agency criteria in one or more pollution parameters. The probable presence of toxic materials in these sediments dictates that they be dredged and disposed of in a careful manner. Of the various potential alternatives for disposal, onshore disposal or encapsulation does not appear to be realistic in the near future.

We believe that selection of a small offshore disposal site beyond the 180-foot contour appears preferable. We strongly recommend that Federal Agencies move to designate such a dumping site and that they immediately initiate monitoring activities to evaluate the impact of disposal of polluted dredged spoils on such an area.

Deepening of the channel from 35 feet to 40 feet would be desirable in reducing the potential number of oil pollution incidents in the harbor, as well as in providing economic benefits. Coincident with this project, removal of old structures encroaching on the channel should be accomplished.

At present, draft limitations dictate that the powerplants and oil terminals be supplied by barge or by small tankers. As a result, old, partially-laden foreign-flag vessels are regularly put into this port. These vessels tend to cause a disproportionate number of pollution problems.

If the channel were deepened to 40 feet, less frequent port calls by larger vessels would be required to meet the demand for fuel in this area. In addition, more modern vessels controlled by domestic companies could be used more exclusively. Thus, for a given fuel requirement a smaller number of more closely controlled vessels operating in a safer channel would reduce the potential for oil pollution incidents.

The dredged spoil material below 35 feet should be almost entirely clean. Available data indicate that there apparently was no effort made by Federal Agencies to differentiate between core samples down to 35 feet and core samples from 35 to 40 feet. The latter samples of undisturbed sediment should be uncontaminated and would presumably meet the Environmental Protection Agency criteria. If so, the largest volume of spoil material resulting from channel dredging could be disposed of in a presently designated dumping ground.

It is strongly recommended that additional efforts be made by Federal Agencies to evaluate the quality and volume of sediments above and below the 35-foot depth. This will, hopefully, contribute to a rational Federal policy regarding dredging of the channel.

Finally, the discussion on page 36 of the report notes that the benthic materials in Fall River Harbor have zinc levels exceeding the EPA guideline of 50 mg/kg (dry weight). No one source was held suspect.

However, if the data in Table 8 were rearranged to match the physical locations of the stations rather than their numerical order, it would have been apparent that the zinc concentration varies from a low at the northernmost station in Fall River, Massachusetts to a peak at the southernmost station in Tiverton, Rhode Island.

If the data for chromium or copper or lead had been analyzed, this same concentration gradient would have been apparent.

I stress this does not positively identify a primary source, but we feel that enforcement officials should have at least attempted to account for the statistically significant increase in metal concentrations going down the bay into Rhode Island.

The second item concerns oil pollution.

The Commonwealth of Massachusetts enacted landmark oil pollution control legislation with the passage of chapter 648 of the Acts of 1968. This law provided that the Division of Water Pollution Control would "undertake immediately, whenever there is spillage, seepage or filtration of oil into any waters of the Commonwealth or into any offshore waters which may result in damage. . .to cause said (oil) to be contained and removed by whatever method it considers best." A revolving fund was established to implement this provision and the procedure was specified for recovery of costs and expenses incurred by the division.

Federal legislation which was enacted several years later follows this same basic format.

The Massachusetts oil pullution law and subsequent amendments also gave the division substantial authority over the operation of marine oil terminals and required evidence of financial responsibility by all vessels transferring petroleum cargoes in Massachusetts waters.

Since passage of this legislation, substantial progress has been made in abating oil pollution throughout the Commonwealth.

Reporting of oil spills to the division has improved significantly in the past several years. This has permitted prompt investigation and usually identification of the sources. Particular note is made of the cooperation and coordination between the U. S. Coast Guard and this division in investigating and combatting oil pollution.

Rapid response to spills has generally permitted prompt containment and minimal damage from spills. All marine oil terminals must, by Massachusetts law, have booms available, and a number also have pickup devices and absorbants. Several service contractors are immediately available and maintain equipment based on the current state of the art.

Additionally, this division has a standby contract with one of the firms and will immediately initiate oil containment and removal if the source is unknown or if the responsible party fails to act.

In the past 3 years, the division has expended about $250,000 Statewide on oil spills, approximately half of which is recoverable. During this time the Federal Government has not expended any funds on oil cleanup in Massachusetts, other than on spills from Federal facilities and spills from U. S. public vessels. The total annual cost for cleanup of oil spills in Massachusetts is estimated at over $1 million. More than 90 percent are cleaned up by the responsible parties.

As a result of our experience in the oil pollution program, we wish to include in the record two areas involving oil pollution where we believe positive action by the Federal Government is required.

First, the Federal Government has not had to expend any funds for oil spill cleanup in Massachusetts other than for pollution caused by Federal facilities or operating forces. While we are relatively satisfied with the present cleanup program, it is our understanding that significant funds have been expended to clean up spills in other States which do not have an active oil pollution control program. These States are, in effect, being subsidized for their lack of action.

We urge that clearer guidelines be established by Federal Agencies for equitable allocation of funds and resources for oil pollution control.

Second, the Water Quality Improvement Act of 1970 provided that any person causing an oil spill would be liable to the U. S. Government for the actual costs incurred for the removal of such oil by the U. S. Government up to an established maximum. The Federal Government has on the one hand pressed for State or local response to oil spills, but on the other hand it has specifically omitted them from protection under the financial responsibility certificates issued in compliance with the Federal law.

As a result, Massachusetts and other States have been forced to pass similar legislation to provide at least comparable protection against financial losses which may be incurred in cleaning up oil spills. This has created a costly administrative headache both to the respective State agencies and to the shipowners, oil companies, marine underwriters, and bonding companies.

We recommend that the Federal law be amended to extend financial protection to State or local government agencies for removal of oil spills by these agencies and to increase financial coverage to include other oil liability claims as well as cleanup costs.

Returning to the enforcement conference report, a review of the oil pollution section of the report, including Table 9, indicates that it may be of some historical value, but it is quite inaccurate regarding present conditions. Montaup Electric Company converted to oil for fuel several years ago and is no longer serviced by colliers.

Concerning the accuracy of data in Table 9, the following corrections and comments are noted:

Fall River Electric Light Company: To be phased out of service by March 1972 and dismantled.

Fall River Gas Company: Discontinued oil operations. No longer an oil terminal.

Firestone Foam Products Company: Plant permanently shut down in September 1971 due to cost of pollution abatement facilities.

Bowen Oil Company: Discontinued use as marine oil terminal years ago. Pier completely disintegrated.

Pacific Oil Company: Property was taken by Redevelopment Authority years ago to put the battleship MASSACHUSETTS in Fall River. The terminal is no longer in existence.

Shell Oil Company: The data on draft and capacity should be corrected. Draft should read 35 feet, capacity 1,199,000 barrels.

Tidewater Associated Oil Company: It was sold to Northeast Products Company, Inc., years ago. The draft should be corrected to 15 feet.

Brayton Point: The draft should be corrected to 36 feet, the capacity to 1,074,000 barrels.

Montaup Electric Company: The draft should be corrected to 35 feet and the capacity to 618,000 barrels.

The demise of a number of these oil terminals is indicative of the moribund economic conditions in this area.

The negative attitude expressed on page 38 of the enforcement conference report regarding rehabilitation of the navigation channel implies that the EPA would prefer to see a continued downward economic trend. This we feel would be extremely unfortunate.

Of the oil spills reported in Massachusetts waters from January through June 1971, three were allegedly from Brayton Point and two near Fall River. As details are not provided, we cannot verify these spills. However, the spills which did occur during this period were extremely minor and, when appropriate, were immediately contained and removed. We have no indication that any damage occurred to beaches, recreational areas, shorefront property, pleasure boats, fish, or other aquatic life from spills in Massachusetts waters during this period.

The marine oil terminals still remaining in Massachusetts have, in compliance with Massachusetts law and licensing conditions, expended capital funds to improve shore facilities to contain all oil spillage. They have purchased oil containment booms, work boats, skimmers, absorbants and chemicals, all of which are immediately at hand should an oil spill occur. They have a rapid and functional oil spill response system.

The division has also brought pressure to bear on major oil companies to upgrade the quality of vessels being sent into Massachusetts waters.

We believe that every reasonable effort is being made by the terminals to prevent oil spillage and to take immediate action if a spill does occur.

However, draft limitations do generally prevent the newer, safer mid-range (MR) tankers from being sent into this port. Instead, older foreign-flag tankers frequently call, and they are involved in the great majority of oil spills which do occur.

We recognize that certain serious pollutional problems do exist in the Mount Hope Bay area. However, it lends little to the credibility of this enforcement conference to treat the oil pollution problem as the report has done, when in fact Massachusetts has made very substantial progress in this program.

It should be noted in the record that some of the most serious chronic oil pollution threats in Mount Hope Bay involve failures on the part of Federal Agencies, specifically:

(1) Failure of the EPA to approve the request of the Corps of Engineers to dredge the Federal channel at least to the prescribed 35-foot depth. Uncharted obstructions in the channel probably represent the single greatest chronic threat of a major oil pollution catastrophe.

(2) Failure of the Environmental Protection Agency to implement reasonable and enforceable regulations over oil separation devices and oil concentration in discharges from bilges, ballast and other shipboard systems. This authority was given to the Environmental Protection Agency under section 11(b) of the Federal Water Pollution Control Act and Executive Order 11548 of July 20, 1970.

In regard to establishing reasonable and enforceable regulations, we find that recommendation 4a of the report is impractical and discriminatory in being aimed at one port. This recommendation would require that discharges contain not more than 10 mg/l of total oil and grease. As technically competent personnel in EPA are aware, few shipboard systems can consistently operate below 100 mg/l. Few U. S. public vessels even have shipboard oil separation systems. Shore facilities can normally achieve 25-50 mg/l oil concentration in their discharges.

We highly recommend that the EPA undertake a demonstration project to develop practical and economic oil separator devices capable of operating consistently at the highest level of oil removal.

Thank you.

MR. STEIN: Thank you.

Are there any comments or questions?

MR. McMAHON: No.

MR. STEIN: Mr. Corey, I have a couple of questions I wonder if you would care to indicate whether it is your own view or the view of the State of Massachusetts that you express here on the disposal of dredged spoils. You indicate some of the spoils wouldn't meet the requirements established by the Environmental Protection Agency for just putting aside, and you suggest that, instead of land disposal, we designate some area and dump that back in the water. Is that the view of Massachusetts?

MR. COREY: We have reviewed this question with EPA and the Corps on several occasions, as I noted. It has been the feeling of the division -- substantiated by inquiries; which I believe EPA personnel may have also found -- that land disposal is highly impractical.

In making inquiries, towns not only will not permit land disposal of polluted dredged spoil materials, many of them have indicated they will not even allow the transportation of polluted dredged spoil materials through their municipalities.

This was the reason for making the statement that we felt that onshore disposal was not feasible at the present time.

The division has as a policy recommended that dredged spoil materials on the Massachusetts Bay side of Massachusetts, for instance, be discharged in a small offshore area, say ordnance disposal area, where it can be safely monitored, rather than discharging it over the traditional dumping grounds as has been done in the past.

We feel that a similar small offshore site well monitored for the disposal of the polluted dredged spoil materials is the best alternative at the present time.

MR. STEIN: I think I understood your rationale the first time, but I appreciated hearing it again, Mr. Corey.

The question I asked you was whether this was the view of yourself or your division or was this the view of the State of Massachusetts -- the official view of the State and your agency.

MR. COREY: It is the position of the agency.

MR. STEIN: Thank you.

I think you had a lot of material in here criticizing the Federal report. Dr. Foster in speaking said he believed that a valuable environmental resource can be saved through a cooperative rather than a competitive approach by pollution abatement agencies. Do you recall that?

MR. COREY: Yes, sir.

MR. STEIN: That was Dr. Foster's report. Well, I don't know. I hope we're going to get some cooperation.

But, again, I begin to wonder when I read sentences like, "The demise of a number of these oil terminals is indicative of the moribund economic conditions in this area. The negative attitude expressed on page 38 of the enforcement conference report regarding rehabilitation of the navigation channel implies that the

EPA would prefer to see a continued downward economic trend."

Well, that may be the first step toward getting cooperation. Again I leave it up to you to make the judgment.

Any other comments or questions?

(No response.)

If not, thank you very much.

MR. PELOQUIN: Mr. Chairman, may I ask a question? I think the question rather should be directed to Mr. Knudson with regard to the sampling of the bottom material.

Mr. Corey makes reference to core samples, and the report indicates that the Corps of Engineers have taken the samples. Were these taken as depth borings or were they interface samples with an Eckman dredge or something of that nature?

MR. STEIN: Do you know, Mr. Knudson, the answer to that question?

MR. PELOQUIN: There are no boring logs in the report. I just wonder what type of bottom samples were taken.

MR. KNUDSON: I think they are surface samples. Would someone --

MR. PELOQUIN: Mud-water interface?

MR. KNUDSON: I think so.

MR. STEIN: Please come to the microphone.

STATEMENT OF
CARL G. HART
CHAIRMAN, ECOLOGICAL ADVISORY GROUP
U. S. ARMY CORPS OF ENGINEERS
WALTHAM, MASSACHUSETTS

MR. HART: I am Carl Hart, Corps of Engineers. I am a geologist.

The samples consisted of both surface samples and core samples, shallow-depth core samples.

MR. PELOQUIN: What was the maximum depth, Carl?

MR. HART: It was 3 or 4 feet.

MR. PELOQUIN: It was 3 or 4 feet?

MR. HART: Right.

MR. PELOQUIN: Thank you.

MR. STEIN: Mr. McMahon.

MR. McMAHON: The next testimony will be by Mr. John R. Elwood, a Supervising Sanitary Engineer with the Division of Water Pollution Control, who is in charge of the research and training program with the division and also has followed all of the general permit requirements involving any thermal discharges from new plants coming into the area of Massachusetts.

STATEMENT OF
JOHN R. ELWOOD
SUPERVISING SANITARY ENGINEER
DIVISION OF WATER POLLUTION CONTROL
COMMONWEALTH OF MASSACHUSETTS
BOSTON, MASSACHUSETTS

MR. ELWOOD: My name is John R. Elwood, Supervising Sanitary Engineer, Massachusetts Division of Water Pollution Control.

I would like to make a statement relative to the control of wastewater discharges from the New England Power Company's Brayton Point station.

The Division of Water Pollution Control has been involved in the development of thermal pollution control measures at the Brayton Point station since the fall of 1969. At that time the power company presented a plan to provide a method of controlling the heated water discharge from the station in connection with a proposed fourth generating unit.

The method proposed was an extended discharge canal which would divert heated water away from the Lee River and provide immediate temperature reduction through entrainment of dilution water in a jet-type discharge.

At approximately the same time, it became apparent that the heated water discharge from the recently completed third unit (construction of which was begun prior to the establishment of the division) was affecting beaches in Swansea. For this reason, and because of other pollution problems associated with the plant, New England Power Company was given an abatement order to eliminate the impingement of heated water on the Swansea beaches and to correct other pollution problems.

This order pertained solely to correcting problems associated with the existing plant and required immediate action by the power company irrespective of the scheduled construction of a fourth generating unit.

Based on review of several studies performed by the power company and of water quality studies performed jointly by our division and the EPA, a permit for a new wastewater discharge outlet was issued on February 10, 1971. Construction of the canal was scheduled to start on March 1, 1970 and to be completed by September 30, 1971. A general scheme for control of fly-ash transport water and other wastes was tentatively approved pending a detailed study by the company's consultant and a pilot plant study by the company which would provide information on which to base a decision pertaining to treatment and disposal of these wastes.

The Division, in conjunction with the Massachusetts Division of Marine Fisheries, continued to meet with the power company to develop suitable controls over the discharge from the proposed fourth unit. Upon the recommendation of the Division of Marine Fisheries, an interim temperature limit of 90 degrees Fahrenheit was imposed on the discharge at the point of exit from the canal.

To meet this condition, the power company proposed two additional methods of control which were:

(1) The introduction into the discharge canal of an amount of dilution water equivalent to the circulating water requirement of the fourth unit; and

(2) A plan to cut back operation of the fourth unit when necessary to meet the 90-degree Fahrenheit temperature limit.

These proposed methods of control were acceptable to both the Divisions of Water Pollution Control and Marine Fisheries.

These and other conditions, including requirements for monitoring all wastewater discharges, a limitation on the use of chlorine, and requirements for continuing ecological and hydrothermal studies of the receiving waters, were incorporated into a permit for the fourth generating unit which was issued on May 6, 1971.

Following this action the division then certified, following a public notice as required under section 21(b) of the Federal Water Quality Improvement Act, that there was reasonable assurance that the operation of the plant under the conditions specified would not cause a violation of the Massachusetts water quality standards.

Due to the fact that the necessary Federal permits have not been forthcoming, no action has been taken toward construction of the canal, and it was necessary to indefinitely extend the completion date under the division's abatement order. Satisfactory progress is being made on the aspects of the abatement order not associated with the canal construction.

The rationale for the division's procedure in handling both the existing problems and the proposed expansion is as follows:

a. Since the Massachusetts water quality standards have no numerical limits for temperature in marine waters, the division policy has been to establish temperature limits for each specific installation following fairly long-term, before-and-after hydrothermal and ecological studies. Prior to completion of such studies and following review of a preliminary engineering report indicating proposed methods of pollution control, an interim permit is issued for the wastewater discharge.

b. Review of several reports submitted by the company, which included both hydrothermal and biological studies, as well as physical hydraulic model studies, indicated that the proposed canal, because of its location and due to the entrainment aspects, would probably provide a sufficient degree of control for the existing three-unit plant and might possibly be adequate for a four-unit plant.

It was our intent to evaluate the operation of the canal for the existing plant over two summer periods to verify hydraulic model predictions and to evaluate immediate effects on the marine resources.

c. Verification of the hydraulic model predictions for the three-unit plant would then provide a degree of confidence in the model predictions for a four-unit plant discharge.

d. Studies completed by the Division of Marine Fisheries, EPA, and our own division did not indicate any significant direct effects of the three-unit plant operation either on the water quality in Mount Hope Bay or on the marine fisheries. It was our opinion that direct effects on water quality in the Lee River were correctable by the extended canal.

e. Since there was a possibility that the canal and dilution water would not be an adequate long-term control method, the company was asked to continue development of an onshore method of heat dissipation which could be employed as a permanent control method.

f. Due to the unusually large volume of heated water discharge involved and upon recommendation by the Division of Marine Fisheries, an interim discharge temperature limit of 90 degrees Fahrenheit was imposed on the discharge from the proposed four-unit plant.

g. Since it was felt that a high degree of control over the heated water discharge had been obtained, the division issued a second interim permit for discharge from the fourth unit. Since this unit would not go on line until 1975, there was sufficient time to evaluate the canal and alternative heat dissipation methods.

h. Finally, it is our opinion that sufficient controls were obtained to prevent any gross or irrevocable effects on the marine resources and that adequate provisions were being made to evaluate the subtle or long-term effects on these resources.

We are cognizant of the fact that the Federal Government through the Corps of Engineers and the Environmental Protection Agency are attempting to impose more stringent controls over the heated water discharge from Brayton Point, as conditions of their permit, than are included in the State's permit. We have no argument with these conditions and, in fact, have made provisions for most of them within what we consider a more realistic time frame.

For example, we have lowered the maximum permissible chlorine residuals as conditions of our generating plant permits from 0.7 mg/l (which was imposed on Salem Harbor station in 1969) to 0.1 mg/l (which was imposed as a condition of the permits of the Pilgrim, Mystic, and Brayton Point stations). This was done based on actual operating experience.

We realize that it may be necessary to further reduce this level and possibly eliminate the use of chlorine in some instances. Our approach concerning the use of chlorine is to require adequate controls and monitoring so that a final determination can be made at the end of the interim permit period.

We and the Division of Marine Fisheries have never been in favor of establishing mixing zones with temperature limits set along arbitrary lines of demarcation. We have not been able to determine a "biological rationale" for selecting arbitrary areas and temperatures which are not only scientifically unsound but would be difficult to enforce.

Finally, onshore methods of heat dissipation have not been widely used at generating plants using salt water for condenser cooling, and we feel they should be properly evaluated prior to a commitment to their use and to be assured that they do not produce more undesirable effects than they eliminate.

The division has been involved in controlling heated water discharges associated with development of new electric generating plants for the past 5 years. During that time we have issued permits to five major installations in the coastal zone. A 4-year "before and after" study has been completed on one plant (Canal Electric plant in Sandwich) and necessary modifications have been requested and are being designed.

A second long-term study at the Pilgrim nuclear station is approximately half completed.

A third study is underway at Salem Harbor.

All of these studies have been or are being accomplished under the guidance of Federal-State technical advisory commitiees. When several more of these studies are completed, we will be in a much better position to establish numerical water quality temperature criteria for marine waters than we are at the present time.

We feel that this is a sound approach to the very complex problems associated with the control of thermal discharge in the coastal zone. Attempts to solve all of these problems with one application of a Federal permit system are not only unrealistic but are actually causing delays in the implementation of planned pollution abatement programs.

Thank you.

MR. STEIN: Thank you.

Are there any comments or questions?

MR. PAHREN: I have a comment, Mr. Elwood.

In setting your own restrictions on heated discharge, it appears that you are ignoring the reports put out by 27 internationally known experts on the effects of heated discharge on the environment -- namely, the people who came up with the National Technical Advisory Committee Report.

These conditions are minimum conditions that should be considered in determining whether or not any heated effluent will have an effect on receiving waters. We think that it is a mistake to ignore the recommendations that have been put out by these experts.

I also have a question at this time. You indicated that the Federal permit has not been forthcoming to date and that this has been holding up pollution abatement. When did the company apply for the permit?

MR. ELWOOD: The Federal permit?

MR. PAHREN: Yes.

MR. ELWOOD: I assume shortly after they received certification from the State.

MR. PAHREN: Do you know what month this year?

MR. ELWOOD: Well, the date of our permit was May 6, 1971. I think the date of our certification was May 30. At that point they had cleared all the requirements of the State, and, as far as we were concerned, the road was open to issue a Federal permit and go through the hearing procedures.

MR. PAHREN: You mean rubberstamp your permit?

MR. ELWOOD: No, not in effect. The Corps of Engineers has to issue a public notice and, if they desire, have a public hearing prior to the issuing of their permits. They cannot begin this sequence of operations until they receive certification from the State, which we produced on May 30, 1971.

MR. PAHREN: I don't know the answer as to when they applied myself, but it has been in the last few months I think, has it not?

Mr. Fogarty, do you know?

This is Mr. Frank Fogarty, Corps of Engineers.

MR. FOGARTY: I recall that the permit came in around June of 1971. The power company is here. They can tell you more exactly.

MR. PAHREN: Well, the main point I wanted to make is that the implication has been that the lack of approval of the Federal permit has been stalling pollution abatement, and the point I want to make is it has not been too long ago that the permit application was received.

That's all. I have no further questions.

MR. STEIN: All right. Thank you.

I am a little optimistic on this. You know, Mr. Elwood says, in reference to your conditions presumably, "We have no argument with these conditions and, in fact, have made provisions for most of them within what we consider a more realistic time frame." I think if we approach it in that spirit we may be able to work something out.

We have a representative of Congresswoman Margaret Heckler here. Miss Caroline Isber, would you stand up? I understand you don't want to make a statement?

MISS CAROLINE ISBER: Correct. I am just listening to take back information to Mrs. Heckler.

MR. STEIN: Thank you very much.

Mr. McMahon.

MR. McMAHON: At this time, Mr. Chairman, I would like to call on Mr. P. H. R. Cahill, who is Assistant General Counsel for the New England Power Company.

STATEMENT OF
PHILIP H. R. CAHILL
ASSISTANT GENERAL COUNSEL
NEW ENGLAND POWER COMPANY
WESTBORO, MASSACHUSETTS

MR. CAHILL: Mr. Chairman and conferees, my name is Philip Cahill, and I am Assistant General Counsel for New England Power Company, whose Brayton Point electric generating station has been the subject of a good deal of critical comment in this conference.

We regard this conference as an extremely serious occasion, not principally for our company, although it is extremely important, nor for industry generally, but for everyone, for all the people in Massachusetts and Rhode Island and, indeed, all of the New England States.

Massachusetts is a highly industrialized State, especially so on its Eastern seaboard, and it has been so for a dozen or more generations. So has Rhode Island. Neither of them can sustain the industry on which their economies depend without an adequate and reliable supply of electric energy on a reasonably economic basis.

The continuing ability of New England Power Company and other New England electric utilities to produce this power economically while at the same time preserving, or indeed in some cases contributing to, the improvement of the environment as it presently exists depends upon establishing benefit objectives which are reachable in terms of feasible capital costs and continuing expenses.

My statement this afternoon as it relates to the pollution report, which is the principal focus of this conference, must necessarily be brief since, except for a hurried look yesterday at a borrowed copy of the report, none of us at New England Power has had an opportunity to review the stated conclusions and recommendations it sets forth, not to mention the supporting data, since copies of the report were only distributed today.

Neither have we seen or in one case had suggested to us prior to today some of the criteria proposed for Brayton Point which were read into the record by Mr. Corkin this morning.

Environmental Protection Agency's regional office, however, is aware I am sure of the many steps which New England Power Company is preparing to take and the numerous environmentally-oriented commitments, conditions, which it has already undertaken to meet in developing its Brayton

Point station to continue what is a vital role in maintaining an adequate, reliable, and economic supply of energy in New England.

I believe that the Department of Natural Resources of the Commonwealth of Massachusetts and its Division of Water Pollution Control and also the Rhode Island Department of Health are fully aware of the work that New England Power has done and is preparing and committed to at Brayton Point.

In the light of our lack of opportunity to study the Agency report and our consequent inability at this time to offer a detailed commentary on it, we would most strongly support Secretary Foster's position that there be an adjournment of this conference at such time as the presently scheduled activities conclude -- an adjournment to a date hopefully early next year -- and that at the adjourned conference parties interested and affected, not limited to public agencies but including private parties involved, would have an opportunity, after adequate review of this report and its recommendations, to present their positions and proposals in an atmosphere of cooperation and mutual concern for the overall future of Massachusetts and Rhode Island, their people and their needs, including the economy which sustains the people and provides for their needs.

In any event, on behalf of New England Power Company, I would most urgently request a minimum period of 30 days within which the company would be able to prepare and present its position to the conferees of this enforcement conference in evidentiary form before the conference, as contrasted with the report, comes to any final conclusions or makes any final recommendations.

Our review of the EPA's report has, as I said, necessarily been limited to a pretty hasty perusal. However, there is one highly important element, important to all of us, which I have not observed in the pollution report, and that is a recognition of the ultimate necessity for establishing and maintaining viable and appropriate relationships between benefits and the costs associated with them.

We are doing our utmost to cooperate, and, frankly, we are prepared to cooperate until it hurts. But cooperation cannot be a one-way street. If it cannot take place in a climate where there is a balancing of all involved interests, then it is not cooperation and really nothing but stagnation results. We do not want that to happen in Massachusetts or in Rhode Island.

If there are any detailed questions, Mr. Edward A. Plumley, who is a Vice President of New England Power Company, is here with me, although, as I previously stated, he has had no more opportunities than I to examine the pollution report in detail.

MR. STEIN: Are there any comments or questions?

MR. PAHREN: No.

MR. CAHILL: Thank you, gentlemen.

MR. STEIN: Thank you.

You know, Mr. Cahill, I appreciate what you say, and I am very sympathetic with your point of view. I think that the key here, as Dr. Foster points out, is cooperation. But I know you are skirting around this, and there are other elements in this. That is, this is a Federal conference. We have the Corps of Engineers and EPA, and it is a Federal permit we are talking about.

But when we plead for cooperation and we talk about the economic and ecological benefit of the people of Massachusetts and Rhode Island, I am all for that, but in a little old city school that I went to, even in those days Massachusetts and Rhode Island were part of the United States. And if we are going to meet again, I think if we are going to work this cooperatively there are at least three parties, governmental parties.

MR. CAHILL: Thank you, sir.

MR. McMAHON: Mr. Chairman, I had a prepared statement of roughly two pages. It is virtually the same as what Dr. Foster presented this morning, at which time he indicated we would have 16 recommendations of the conferees from Massachusetts.

I would like to eliminate the reading of the statement prior to the listing of the 16 recommendations of the conferees if I may have it included in the record.

MR. STEIN: Without objection, this will be included as if read.

STATEMENT OF
THOMAS C. McMAHON
DIRECTOR, DIVISION OF WATER POLLUTION CONTROL
DEPARTMENT OF NATURAL RESOURCES
COMMONWEALTH OF MASSACHUSETTS
BOSTON, MASSACHUSETTS

MR. McMAHON: Mr. Chairman, ladies and gentlemen, my name is Thomas C. McMahon, Director of the Division of Water Pollution Control, under the Massachusetts Water Resources Commission, in the Department of Natural Resources. Our agency was created under chapter 685 of the Acts of 1966 with the responsibility to enhance the quality and value of the water resources of the Commonwealth and to establish a program for the prevention, control, and abatement of water pollution.

We are certainly pleased to be here today to have the opportunity to explain the major programs and accomplishments of the Commonwealth of Massachusetts in water pollution control and particularly in the Mount Hope Bay - Taunton River area.

The water quality problems in the subject area are most serious, requiring the continuation and even acceleration of the current program to attain the water quality goals established in 1967.

The Mount Hope Bay report prepared by the Environmental Protection Agency depicts the degradation that has taken place historically but does not make reference to progress or programs of municipal and industrial waste treatment already well under way. Were I not directly involved as a State administrator, I could question from this report whether in fact there were State programs in existence in either Rhode Island or Massachusetts.

Unfortunately, the report was prepared independently by the Environmental Protection Agency without State input or review consideration and reflects a viewpoint markedly different than that of the Massachusetts conferees. The conclusion of the report for technical and policy reasons is unacceptable in its present form.

The Massachusetts program features two bond issues totaling $400 million for State construction grants, including prefinancing the Federal share in anticipation of future Federal reimbursements; $1 million a year for research and demonstration grants; two tax inducements for industries; a modern, up-to-date, and enforceable law; a model oil pollution control program; and other components associated with a modern State regulatory program. In short, we are serious on abatement and control of water pollution in Massachusetts.

There has been a presentation today by representatives of the Commonwealth delineating:

1. The State implementation and enforcement program in the conference area;

2. Recommendations on dredging and oil pollution control; and

3. A summary of the abatement order, permit, and certification conditions of the New England Power Company Brayton Point facility.

The summary and recommendations of the federally-prepared Mount Hope Bay report do not relate to a coordinated, cooperative effort to solve the many varied problems of the subject area. The Commonwealth of Massachusetts conferees will submit 16 recommendations which will define a broader and sounder program for cooperative Federal and State action in this area.

These recommendations of the conferees from Massachusetts we are requesting as a substitute for those proposed by the Environmental Protection Agency report.

1. All municipalities and industries discharging wastes into the receiving waters within the Mount Hope Bay watershed provide appropriate treatment in accordance with the Massachusetts water quality standards as approved by the Secretary of the Interior in 1967. Appropriate treatment is defined as a minimum of secondary treatment for discharges to freshwaters and such degree of treatment as necessary to meet the water quality standards in coastal and marine waters.

2. All waste sources discharging domestic wastes to receiving waters in the Mount Hope Bay watershed provide disinfection of their wastewater effluents in accordance with the Massachusetts water quality standards.

3. There be a reduction or elimination of any material or, if necessary, all materials contained in any discharge which singly or in combination are toxic or harmful to human health or aquatic life.

4. That the Federal Agencies conduct a more detailed dredge survey in the Federal channel to Fall River; specifically the core samples above 35 feet and below 35 feet should be segregated and analyzed separately.

5. That the Federal Agencies select a small dumping site outside the 180-foot contour for disposal of polluted dredged spoils and that they immediately initiate monitoring of the site.

6. That Federal Agencies undertake a research and demonstration project to demonstrate equipment that will achieve the highest practical level of oil removal.

7. The Environmental Protection Agency implement regulations over oil separation devices and oil concentration in discharges from bilges, ballast, and other shipboard systems, in accordance with the authority given to the Environmental Protection Agency under section 11(6) of the Federal Water Pollution Control Act and Executive Order 11548 of July 20, 1970.

8. Clearer guidelines be established by Federal Agencies for equitable allocation of funds and resources for oil pollution control.

9. Federal law be amended or rules and regulations promulgated to extend equal financial protection to State or local government agencies for the removal of oil spills by those agencies and to increase financial coverage to include other oil liability claims as well as cleanup costs.

10. The Environmental Protection Agency establish water quality monitors at critical locations throughout the

Taunton River and Mount Hope Bay, in order to provide continuous water quality data.

11. The Massachusetts Division of Water Pollution Control continue its program for development of a comprehensive basin plan for the Taunton River and Mount Hope Bay which should include but not be limited to the following:

a. Alternate methods and levels of treatment necessary to meet the water quality standards.

b. Evaluation of possible inter-municipal and industrial waste treatment arrangements.

c. Determination of allowable waste loadings in the Taunton River Basin through stream and estuarine analysis techniques.

d. Evaluation of the need for nutrient removal and determination of a basinwide plan to handle the eutrophication problem.

12. The Environmental Protection Agency develop and pursue a research program which will clearly show the effects that the thermal, municipal and industrial wastes have upon the biota of Mount Hope Bay. Such a study should include thermal mapping of the bay, a qualitative and quantitative determination of the resident and migratory fishes in the bay, mapping the current patterns, and an investigation of the benthic plants, animals, and plankton

in their natural environment, and the effects of toxicants upon important species of the area.

13. Any Federal construction or operating permit for the New England Power Company facilities at Brayton Point shall be suitably conditioned to insure that the Massachusetts water quality standards are met at all times.

14. To minimize the possibility of sediments contaminated by mercury be lost to the Taunton River:

a. The flow in Muddy Cove Brook be diverted from the lagoon at a point upstream of the plant to a point downstream of the lagoon and all wastes from the plant be discharged to the diversion.

b. I.C.I. continue the proposed program of drilling test wells to determine whether or not there is contamination in the groundwater.

15. The Environmental Protection Agency or some other Federal Agency identify the chemicals, domestic or imported, that now contain mercury and establish a program to eliminate or reduce mercury to minimum levels in these chemicals.

16. The Division of Water Pollution Control determine what should be done with the mercury-laden

sediments in Muddy Cove lagoon to minimize pollution in the environment.

MR. STEIN: Before you go further, what does "I.C.I. mean, for the record?

MR. FERULLO: Imperial Chemical Industries.

MR. STEIN: All right. Let that appear.

Are there any comments or questions?

MR. PAHREN: I would like to comment on Item 1. You mention that all municipalities and industries discharging, etc., in accordance with Massachusetts water quality standards approved in 1967. Now, there are 32 dischargers that did not appear in the 1967 submission, 20 small dischargers and 12 significant ones, and these as I interpret Item 1 have been omitted.

MR. McMAHON: These should be included. Any requirements under No. 1 would include industries or municipalities under the original schedule and any new ones that have been picked up since that time.

MR. PAHREN: Fine.

MR. STEIN: Any other comments or questions?

(No response.)

If not, thank you.

We're going to try to push on without a recess because we don't have this room after 5 o'clock.

MR. McMAHON: I would next like to call on Mr. Francis L. Kelly who is on the Committee for the Protection of the Lee River Environment in Swansea, Massachusetts.

STATEMENT OF
FRANCIS L. KELLY
COMMITTEE FOR THE PROTECTION OF THE LEE RIVER ENVIRONMENT
SWANSEA, MASSACHUSETTS

MR. KELLY: Mr. Chairman, conferees, my name is Francis L. Kelly. I represent a citizens' group known as the Committee for the Protection of the Lee River Environment.

We wish to thank those people responsible for the comprehensive report presented by the Environmental Protection Agency for this conference. We appreciate it. It represents a tremendous effort.

Our group is particularly concerned with the area and the report which concerns the destruction of the Lee River and Mount Hope Bay by the operation of the Brayton Point facility of the New England Power Company.

We have complained long and bitterly about the operations at this plant. This report cites destruction of fish by chemicals, destruction of fish and marine organisms by entrainment, mechanical means, fly ash concentrations in the wash, fly ash transport water heavily laden with metals far in excess of national standards, thermal buildup in Mount Hope Bay, temperatures in the Lee River in excess of 90 degrees, algae covering both shores of this river, algal blooms in the Lee River and Mount Hope Bay.

Despite the information contained in this report, we who live in the area affected by this plant are faced with the possibility of a fourth unit being constructed at Brayton Point. We think that this is outrageous.

I would like to briefly review the history of the operation of the Brayton Point plant.

MR. STEIN: Pardon me. Before you go on with this, I think the way the law is constituted now you need a Federal permit before you can construct that fourth unit. And I am not just pointing to the Brayton Point plant. I think every powerplant is in the same situation.

MR. KELLY: Mr. Chairman, I am aware of that. New England Power has applied for the permits for the fourth unit. Some of these permits have been granted -- none of the Federal ones that I know of.

But, as I said, despite this destruction, we are faced with that possibility of a fourth unit.

I would like to briefly review the history of the operation of the Brayton Point plant.

The New England Power Company in 1959 purchased 262 acres of land at Brayton Point and announced plans to construct an electric generating station. In 1963-64 they put units Nos. 1 and 2 on the line with total generating capacity of 500 megawatts. For condenser cooling water this plant drew 360,000 gallons of water a minute from the Taunton River and discharged it into the Lee River.

In this process, the water was heated approximately 13 degrees.

The Lee River is a small tidal estuary and was not able to handle this thermal load.

In addition to the heat, the river showed evidence of fly ash, and New England Power was discharging scum with their effluent which I have witnessed which covered the shores of the Lee River from Brayton Point to Garden Neck.

Area residents who would use this river for recreational purposes were complaining about these conditions.

In 1967, the Commonwealth of Massachusetts, in order to comply with the Federal Clean Water Act of 1965, had to classify the various bodies of water. The Lee River was classified SA, highest water quality use. Taunton River was classified SB, existing condition D.

In 1969 a study conducted by the Raytheon Company showed that the discharge of 360,000 gallons of water a minute by units 1 and 2 was, in fact, heating the Lee River approximately 7.5 degrees above normal.

In the fall of 1969, despite all complaints, despite the SA classification of this river, despite the information contained in the Raytheon report, the various State and Federal regulatory agencies allowed this plant to put a third unit on the line and increase their discharge from 360,000 gallons of water per minute to 620,000 gallons of water per minute with a temperature increase of 16 degrees. The effect of this tremendous volume of hot water was disastrous on this river.

In the winter of 1969-70, when the island of Martha's Vineyard and Nantucket was icebound, there was not a piece of ice in the Lee River.

In the winter of 1970-71, Mount Hope Bay was frozen over. Not a piece of ice in the Lee River.

In the summer of 1970, the condition of the river was just unbelievable. We couldn't use it. There was temperature in excess of 90 degrees. Scummy. Fly ash concentrations.

A highly successful Red Cross swimming program was conducted in this river for years. In the summer of 1970 the children on several occasions had to be removed from the water by swimming instructors for fear of their health.

In the summer of 1971 the conditions were worse.

Recorded temperatures of this river were 92, 94, 95 degrees. New England Power was discharging 620,000 gallons of hot water in excess of 100 degrees.

In 1970, in August of 1970, due to the close proximity between the oil terminal and the intake structure of the Taunton River at Brayton Point, there was an oil spill. The New England Power drew the oil through the plant with condenser cooling water and actually pumped it into the Lee River. Direct violation of State and Federal law. It covered some children who were swimming, fouled several miles of the Fall River shoreline.

In answer to our complaints, the Massachusetts Division of Water Pollution Control conducted an investigation of the discharges from this plant and placed it under abatement order in October of 1970. They were given an abatement schedule -- plans date September 1971. They have not complied.

In January there was another oil spill at this terminal. The oil found its way across the Taunton River and fouled sections of the Fall River shoreline.

In April of 1971 there was a fish kill at the discharge canal of the New England Power Company. The plant superintendent was quoted as saying that he could see no difference whether the fish were killed by a chemical in the river or by a fisherman.

They have been indicted by a Federal grand jury for this fish kill.

Despite all of this, a fourth unit is possible at this site.

Along with the destruction of this river, the Lee River, which we have enjoyed for years for recreational purposes -- and I appreciate that this conference is concerned with the destruction of the waters of Mount Hope Bay -- we who live in the area of this plant are also the unwilling victims of air pollution and noise pollution. And either due to atmospheric conditions, faulty stack control devices, negligent operating procedures, or just the fact the plant is too big for the area atmosphere to handle, we are occasionally showered with oil soot.

Some of you gentlemen no doubt have homes. You take pride in them. We do. It's quite a thing to come out and see your property covered with this soot, your house flecked with black oil smudges.

Some of you no doubt are amateur gardeners. It's quite a thing to see a plant or a bush or a tree that you have watered and fertilized and nursed and watched it grow and you come out one day and the foliage is covered with black spots. Two days later the acid in the ash has burned holes through it. Several days later the buds fall off and the thing shrivels up and dies.

I don't think it's a condition we have to live with. We shouldn't. We shouldn't be forced to live with it.

Noise pollution. Garden Neck area was considered highly residential. New England Power knew full well we were there. Yet the third unit, 625 megawatts, is housed in an open frame structure. If you stand on Garden Neck and look east to Brayton Point, you will look right into the plant -- 7, 8, 9 stories high.

There is no wall on the west side. You will see structural steel columns, structural steel floor girders.

The noise from this plant comes across 2,000 feet of open water and bombards us.

We have a copy of a letter from a former Commissioner of the Department of Public Health, Commonwealth of Massachusetts, Dr. Alfred Frechette. He states the noise is a potential health hazard.

New England Power has been made to abate some of this noise, but the remaining level is still excessive. We go to bed with the noise at night. We wake up with the hum of equipment in the morning. When we tell them to close it in, stop it, they say, "We'll do that when we build the fourth unit."

For us in this area to suffer this environmental destruction is difficult.

To answer the area complaints, there was a public hearing held in the town of Swansea, Massachusetts in the summer of 1969 prior to the operation of the third unit. At this meeting we were urged to be kind, to be tolerant, to be patient, that when the third unit was constructed all of these problems would be resolved, that they would go away.

Nothing was further from the truth.

Now we are being told by certain employees of State and Federal agencies that things will be better when the fourth unit is constructed.

It is common knowledge the New England Power Company plans five units at Brayton Point. Will I be standing here 3 or 4 years from now complaining about the destruction caused by the fourth unit and be told that things will be better when a fifth unit is constructed?

The need for power. At a public hearing held in Somerset, Massachusetts in September of this year by the Massachusetts Department of Public Health concerning the air permit for a fourth unit, an employee of the New England Power Company testified that 50 percent of the production of a third unit at Brayton Point is transmitted to New York. Is it difficult for us to suffer as we do so that some guy in

New York can enjoy the wonders of total electric living?

I have never seen a report written by the New England Power Company concerning the fourth unit at Brayton Point but what they also include the phrase "to satisfy the urgent demand for power." Yet it's a demand that they are allowed to create. Cash bonuses for the conversion to electric heat. Saturation advertising in newspapers, magazines, radio, television, preaching the wonders of total electric living.

Yet the officials of the New England Power Company have admitted to me, "Yes, we have environmental problems at Brayton Point but we're working on them." Unit No. 3 has been on the line at that site for 2 years. It was under construction for 3 years prior to that. I think it is safe to say it was in the planning and design stage 3 to 5 years before that. That's a total of 8 to 10 years. I would suggest that they are out of time.

Rather than any thought being given to expanding that plant, serious thought should be given to curtailing its operations until they learn to operate it efficiently without this environmental destruction.

The Providence Sunday Journal of November 28, 1971 had an article entitled "The Death of Escambia Bay in Pensacola, Florida." It was an incredible story about total destruction of a recreational area, a place where people used to swim and boat.

One of the major contributors to the destruction, according to the article, was the Gulf Power Company by discharging fly ash and heated water effluent.

I urge you to see that the recommendations contained in this report concerning the Brayton Point facility are implemented so that at some future date we will not be able to read a story entitled "The Death of Mount Hope Bay."

I thank you very much.

MR. STEIN: Thank you. Are there any comments?

(No response.)

Well, we had a case in Escambia Bay too. Hopefully, we are here before the situation developed the way it did there.

MR. KELLY: Mr. Chairman, I just hope that story was not the truth.

MR. STEIN: I'm not sure it is. You know, we can't discuss other cases. But really the problem in Escambia Bay -- or the reason we have the problems -- is extreme eutrophication due to nutrients. You can make your own judgment. I don't think-- At least in our report we didn't consider the power company to be a major source of nutrients.

But the problem is we have so many nutrients in that bay now that, no matter what we do, we have these tremendous fish kills because of lack of oxygen when the weather gets warm. Down there it gets warm pretty frequently.

MR. KELLY: Thank you.

MR. STEIN: Thank you.

MR. PAHREN: Mr. Kelly, I have one question if you can wait one second.

Do you have an estimate of the damage to vegetation due to the acid smut and other air pollutants?

MR. KELLY: I know that it has cost the New England Power Company thousands and thousands and thousands of dollars to pay claims for damages caused by the stack emissions.

I do know there are several large fruit growers in the area who have sustained considerable monetary damage. I saw one letter -- I think it was from the Swansea Orchards -- where the owner was advised that the trees probably would not come back and bear fruit for approximately 3 to 4 years.

As to people in my area, New England Power Company has paid them, some of them, once, twice, three times, to have their homes washed and their cars washed and their homes painted. They have declined to pay the damage to plant life.

On my own property, the front of my property, I have four tremendous maple trees. Along the west side of my property I have flowering shrubs; different varieties of this flower every month of the growing season. This past summer it looked like I had taken a child's water gun and filled it with acid and just squirted everything with acid. It was all just burned with holes -- tremendous.

I plant a small vegetable garden. It's about 12 x 12. And there are 12 tomato plants and 12 pepper plants -- just something I want to see grow. And I'll come home from the office at night, have dinner, go out and putter around, and it's quite a thing to see it just covered with these small black flecks of fly ash. And the acid in it in a day, with the moisture of the dew off the bay, just burns holes through it. And that's all there is to it.

I suppose you could complain that the tomato plants are worth 50 cents apiece or something and get paid. I don't know. But I don't think that's the point.

MR. PAHREN: Thank you, Mr. Kelly.

MR. STEIN: Any further questions?

(No response.)

Thank you.

I believe you have a witness, Mr. Shea.

MR. SHEA: Mr. Barbour would like to make a statement now.

STATEMENT OF
WILLIAM E. BARBOUR
BRISTOL, RHODE ISLAND

MR. BARBOUR: My name is William Barbour. I am the President of the Environment Council of Rhode Island, but on this occasion I wish to testify as a private citizen and homeowner.

I live on Viking Drive in Bristol, and I own 100 feet of shoreline property on Mount Hope Bay approximately midway between Mount Hope and the Bristol Narrows.

Last spring, after a big storm, I noticed an accumulation of thick, black, greasy material along my beach and all along the Rhode Island shoreline. I thought this was an oil spill. I reported it to the Rhode Island Water Pollution Control, who inspected it and diagnosed it as probably grease and probably emanating from the Fall River sewage treatment plant as a result of the storm and due to their combined system.

I considered taking legal action, but I did not proceed at that time.

I only cite this as an example of the kind of material that is occasionally discharged into the bay and finds its way over to the Bristol shore. I am located approximately 2 miles from the Fall River outfall.

On another matter, I noticed that the waters along my property are becoming increasingly dirty on certain days during the summer, and each summer they seem to be a little dirtier. I am not sure whether this is the result of normal drainage flow into the bay or whether it is due to man-made facilities that discharge materials into the bay untreated.

But this certainly has a restraining influence on some of my more fastidious neighbors who wish to swim in the bay, and I feel that it definitely impairs the value of the bay for recreation.

On another matter, I own a sailboat, and every summer there is an accumulation of algal growth on the waterline of my boat and other boats. I am told that this is perhaps due to, among other things, increased temperature resulting from thermal pollution. I cite this as a further example.

Although I am located about 3 miles from Brayton Point, I can imagine that the powerplant may have some effect on the waterline of my sailboat.

This completes my statement.

MR. STEIN: Thank you.

Are there any comments or questions?

(No response.)

Thank you very much.

Next we have Dr. James W. Holt, Save the Bay, Tiverton, Rhode Island.

STATEMENT OF

DR. JAMES W. HOLT

SAVE THE BAY

TIVERTON, RHODE ISLAND

DR. HOLT: I am speaking in behalf of Save the Bay, Inc., an organization that has been in business less than a year but which has a membership in excess of 15,000 people. These members reside in Rhode Island and in nearby Massachusetts.

Our reason for being is to work toward a viable bay. Our efforts are directed toward cleaning up the bay along with keeping potential polluters from moving into the area.

We recognize the bay as our greatest single natural asset. We feel we are not negative in our attitude but actually very positive in our attitude. We recognize that the commercial and recreational aspect of Narragansett Bay is Rhode Island's greatest single moneymaker. Boating, fishing, hotels, boatels, boatyards, and fish processing plants, along with all the other industries associated with the bay, represent a goodly part of Rhode Island's wealth.

We recognize Governor Licht's labeling this as the "Ocean State." We are concerned citizens of the State community, and we well appreciate your concern. We wish to help you to make Mount Hope Bay cleaner, to make Narragansett Bay cleaner, and to bring some order out of chaos.

I would like to make a few comments regarding the Tiverton oil terminals and oil spillages as reported on pages 37 and 38 and especially on page 8 of the introduction to your report.

If you will refer to page 8 of the report, under paragraph 10 there is mention of the total oil spills amounting to something less than 1,000 gallons. Despite the source of your material, which is probably the U. S. Coast Guard and the Rhode Island Department of Health, the amount of oil from one spill of the Northeast Terminal alone amounts to this amount or more.

I have photographic evidence to prove my statement. And though this data was presented at a public hearing in Tiverton in January of this year, the figures of gallonage have not yet been brought up to the correct level.

I would be willing to offer these pictures for your viewing.

My statement is based on U. S. Navy figures that state, in effect, that if a rainbow effect is seen on the waters, an amount of between 600 and 800 gallons of No. 2 fuel oil per square mile is the amount of spillage.

My pictures will definitely show more than one square mile. And along with the pictures, on this one inspection was the commanding officer of the Coast Guard station at Castle Hill, a warrant officer, Musall. He was there also to witness this amount of rainbow effect.

I would suggest perhaps that you consider viewing these pictures seriously.

We commend you for your interest in our States of Massachusetts and Rhode Island. Thank you for letting me appear before you.

MR. STEIN: Thank you, Dr. Holt.

Any comments or questions?

(No response.)

Chandler W. Johnson.

STATEMENT OF
CHANDLER W. JOHNSON
PROVIDENCE, RHODE ISLAND

MR. JOHNSON: My name is Chandler W. Johnson, a citizen of the State of Rhode Island, and I appear here as a citizen of Rhode Island concerned with the problems with which you are dealing.

I regret that as yet it is apparently impossible for anybody in the State of Rhode Island officially to give as complete a statement of the implementation and enforcement of our clean air and clean water acts as was given by the young lady from Massachusetts.

As evidence of my concern being shared by many other citizens of this State, I would like to read and introduce as part of the record of your proceedings here -- I respectfully request that this be done, Mr. Chairman -- a short editorial that appeared in the Providence Sunday Journal dated December 5, 1971 entitled "Disaster Site."

"Mount Hope Bay, fouled by wastes from seven cities and towns and 80 industries, all in Massachusetts, is a water pollution disaster site, and unless the Federal Government uses every weapon at its command to bring the situation under control, the bay will die. Rhode Island's stake in the Federal effort is very large, indeed.

"Rhode Islanders have focused their attention over the years on the pollution problems of Narragansett Bay. Understandably, this body of water, which is wholly surrounded by Rhode Island, rates first consideration in planning and spending for elimination of the sources of water pollution. That job is far from done and will continue to demand attention.

"But 71 percent of the waters of Mount Hope Bay are within the boundaries of Rhode Island. Further, the flow from Mount Hope Bay discharges into the ocean through Rhode Island. Part of the flow moves directly into Narragansett Bay; part gets to the ocean by way of the Sakonnet River which borders Rhode Island towns.

"The very best efforts that Rhode Island makes to clean up Narragansett Bay can be seriously and adversely affected by a failure in Massachusetts to bring under control a situation which is dismaying...

"The mess in Mount Hope Bay will be subjected to intensive review at a conference here in Providence the day after tomorrow when representatives of the Federal Environmental Protection Agency will meet with concerned public officials and interested citizens. The basis for the review is formal EPA analysis of conditions in Mount Hope Bay.

"Major offenders are the inadequate sewage treatment plants in Fall River, Taunton, Brockton, and Middleborough. But private industry also is contributing heavily to the fouling of the bay, not least the New England Power Company's fossil-fuel generating plant at Brayton Point in Somerset, already under Federal indictment for killing fish in the bay.

"It will not be enough to voice concern; it will not be enough to point accusing fingers at Massachusetts, its cities, towns and industries. The conference next Tuesday must become the first meaningful step in a sustained drive to force offenders to stop pollution or face certain prosecution for failure by the United States Department of Justice."

In conclusion, Mr. Chairman, I would like to point out that there is at least one chamber of commerce in the area, in this region, whose philosophy has become, "What is good for the people of the area" -- which the Greater Boston Chamber of Commerce is serving -- "is good for its business and industries." I only wish I could make the same commending remarks about the Providence Chamber of Commerce.

Thank you very much, Mr. Chairman.

MR. STEIN: Thank you.

Any comments or questions?

(No response.)

Thank you very much.

Are there any other people who want to make a statement as part of the public presentation?

(No response.)

If not, I would ask the conferees how you propose we proceed at the present time.

MR. McMAHON: Mr. Chairman, I think Dr. Foster sort of indicated this morning that obviously the 16 recommendations that the State has are somewhat different and in a somewhat different vein than what the Environmental Protection Agency report depicted.

I would like to make it quite clear to everyone here that there is really no large difference between the attitude of the Federal Government and the Commonwealth of Massachusetts. In short, we are interested in abatement of pollution and control at the earliest possible time.

Unfortunately, I think we ran into a particular situation here where, through semantics and through what I would consider attempting to use the conference mechanism to put in effluent standards whereas this is not really in conformance with the Federal Water Quality Act of 1965 nor our own water quality standards program in Massachusetts, we have some fairly significant differences.

Whether or not these could be worked out for a mutual recommendation in this particular conference in a short period of time, I would suspect the answer would be no.

On the other hand, I think certainly over a period of time there could be an opportunity for the regional office of the Environmental Protection Agency and our own offices to sit down and mutually go over the recommendations of both agencies to see if we can agree on some summary and recommendations.

As to the entire report, whether it should really be scrutinized by both parties, again I would suspect it probably should. But I think there is room, for example, to perhaps terminate the conference at this time and come back within 30 days after we have had an opportunity to discuss this technically.

MR. STEIN: Are there any other comments?

MR. PELOQUIN: Mr. Chairman, I think based on the experience that we had at Lake Champlain conference, I would concur with Mr. McMahon, although I would suggest that perhaps the conferees meet as he suggested within 30 days, not necessarily in a public session but in a work session.

I have been trying to analyze the differences between the 16 points or recommendations that Massachusetts has and these recommendations, and I see some differences. Also, I think we have to analyze the completion schedule which has been submitted and see just how this meets with the recommendations that were set forth by the Federal Agency.

I think the best way to do this would be in a conference, preferably either in EPA or in the interstate office, at sometime in the near future to try to resolve these problems.

MR. STEIN: Again, I think we have several things I would like to just bring out.

One, we do have a request from the power company that they would like to review the report and present some material to us. If that is done, it seems to me that we really have to consider doing that in an open session, because I don't think we can really do that the other way.

The other thing is on the location. I think the conference according to law has to be in or near the site of the pollution. I don't know how far away we can get from it.

As you people know, when you want a closed meeting, you can have a closed meeting. But that doesn't mean you have a secret meeting where no one knows where you meet. Everyone knows where you are, and as far as I'm concerned we tell them what we did.

As I see this, I think one of the big issues we have to resolve is the question of what we are going to do about the discharges from the power company installations at Brayton Point. I think the issues were clearly drawn when we heard the official report, we heard the power company's presentation, and we heard from Mr. Kelly. And I know -- possibly some of you have been following this -- this is a classic type of drawing the issues.

It seems to me if we are to give credence to what the power company has said and give them another crack, we're possibly going to have to arrange to let selected people come in and comment on the technical report. Then maybe we can go into executive session and come up with the recommendations. But you may want to consider that.

MR. PELOQUIN: I think we have to consider the power company's request.

MR. STEIN: Right.

Are there any other comments?

Mr. Shea?

MR. SHEA: No, I concur I think in what has been proposed.

MR. STEIN: Let me say this. I don't think I have the power to adjourn the conference, but I will entertain a motion to recess and to get back in at a date which will be within 30 days.

Now, the question Mr. McGlennon asked is do we want to set a date certain now? I don't know how familiar you are with your schedules, whether you can do it and announce it now.

MR. McMAHON: Mr. Chairman, I think there are probably a couple of items that really should be discussed prior to the date we establish:

No. 1, the general disposition of this report -- on whether certain sections of it should be revised in light of the testimony today. I think this probably can only be ironed out by some of the technical people getting together to see how much work really is involved in doing it.

MR. STEIN: Right.

Here's what I would suggest. We have been through this procedure in several other places. We have worked it out I think with considerable measure of success. The most recent one was in the Houston Ship Channel. We did this for everything but the power company. We didn't include the power company.

I think what we have had here -- and this happens with a measure of frequency -- is some factual information put out by a Federal report. We had some other factual information put out by State representatives and other representatives. And the industry wants to look at this.

I pointed out at the beginning we are never going to go anywhere in solving this problem unless we get substantial agreement about the facts. And the way I look at this record now, there are a lot of loose ends. While there are a lot of facts, they might not be in dispute. And I have the feeling there isn't that much difference, because everyone is looking at the facts. It is just the way it is stated that has to be ironed out.

Until we do that, we are not going to be able to move on to a conclusion.

Now, the facts I am talking about are physical facts or happenings. That is, either someone has a program or has let a contract or he hasn't let a contract, or someone is complying or not complying, or we are talking about discharge or nondischarge and just precisely what it is.

These kinds of physical facts should be and are very capable of being resolved by men of good will. I have worked with the Interstate Commission and with Rhode Island and Massachusetts for years. As far as I can discern, we have never had any difference on the physical facts.

I don't think we have agreed on that here.

Therefore, I would think that we would be wise to try to resolve that.

Now, if we intend to meet in a month, I think we need immediately to appoint a technical committee representing the various agencies to see if those people can get together. Then, when we come into our next meeting, we will have a report from that committee trying to iron out the possibilities here.

As a matter of fact, again I don't want to prejudge this, but while the recommendations of Massachusetts and the Federal recommendations are somewhat different, I don't see that they are incompatible, and I think they can be meshed.

I think this is what we have to make a judgment on. So if that is the case, and if I sense you want to meet in a month, let's do two things. Let us set up this technical committee with representatives. And who shall handle the secretarial? I have forgotten. Do you want us to do that or do you want to?

MR. McMAHON: What?

MR. STEIN: Secretarial for the technical committee. Do you want us to take the initiative? All right.

We will ask Mr. Pahren in the region to do this, to get this started, and we will meet in a month. A month from now just on the calendar is January 7. I don't know whether you want to set this date now or whether you want to recess without setting it.

MR. McGLENNON: Do you want to at the very least set a date for the technical committee to report to the conferees and get sort of an implementation schedule of you naming dates by which time you want something done? Maybe you don't want to do this.

MR. STEIN: No, we do.

Off the record.

(Discussion off the record.)

MR. STEIN: Back on the record.

We can do it early in January if you wish. Do we have a calendar?

MR. McGLENNON: Mine doesn't show that first week, but Friday is the 7th.

MR. PAHREN: How about the 6th of January?

MR. McGLENNON: The 6th, on Thursday? Is this the date for issuing the recommendations?

MR. STEIN: No, no, this is when we will meet.

MR. McGLENNON: This would be to reconvene the conferees in public session?

MR. STEIN: Let's try this. Will the technical committee be able to report to the conferees before the first of the year? Is that too short a time?

MR. SHEA: Ask Tom McMahon. I think it's short.

MR. PELOQUIN: It's pretty tight.

MR. McMAHON: I would hope so.

MR. STEIN: All right. Let us say the technical committee -- I think you should appoint people who have this as a prior job -- will report to us, send their report to all the conferees, before the first of the year.

Then I would make this proposal to you: That we meet on the 6th to hear from the power company and any other people on the technical report, and the 7th if we have to, because I think this is an important thing and we shouldn't get this held over.

How about that?

MR. McGLENNON: How about the technical committee reporting on December 30?

MR. STEIN: Yes.

MR. McGLENNON: That is exactly 1 week prior.

MR. STEIN: Thank you. I think that would be great.

MR. McGLENNON: Do you want to name a place for the meeting?

MR. STEIN: I don't know how big a place you would need. But I think unless you have some other suggestion, it is going to have to be around Providence.

MR. PAHREN: Walter has said he has an auditorium for 100 in his office.

MR. STEIN: We will meet in Providence.

MR. SHEA: You're welcome.

MR. STEIN: How far out is your office?

MR. SHEA: Right behind the stadium.

MR. STEIN: Is it free?

MR. SHEA: Oh, yes. (Laughter)

It was built with Federal aid. (Laughter)

MR. STEIN: That means you charge us the most. (Laughter)

(Off-the-record discussion.)

MR. STEIN: All right. We will announce the place. We don't like to put these hotels out of business. You know, in Virginia -- at least in Washington -- when we rent a hotel room like this, oh, I guess it costs us pretty close between $500 and $1,000. And right where we are we have a new movie theater which has 1,000 seats, and they will rent us that theater during the day for $200, so we can do better there.

MR. SHEA: I would have to check to see that somebody else isn't scheduled.

MR. STEIN: Yes. Let's leave the place. That will be announced. We will either meet in a hotel or at the State offices. We will start the meeting on the 6th.

Now, I would say if anyone other than the power company -- and we are going to have to extend this privilege; that is why I said we have to have an even-handed administration of the law here -- if anyone other than the power company wants to comment on the technical report, we will allow them to do it if they notify their State agency or our regional office in advance.

That will just be comments on either our technical report or the State reports made here, for the purpose of our getting all the facts and perfecting the record so we can move forward. And I think we will look forward to a successful meeting.

Let me once again express my appreciation to you people for being here today.

I do think, while we have recessed this, we have made a tremendous start here. I know some of you may not have seen many of these things. But, obviously, you don't move into a pollution situation from the beginning of time. It's almost like a seamless web that has gone on for a long time. And, you know, you get Federal guys like I am coming into town and some of your neighbor State people coming in, and we have to start somewhere. I think we have made a good start.

The problem I think we have is that the good start is divided up among several significant statements which, while they are not contradictory necessarily or incompatible necessarily, have to be put together. I think we all prefer, if we could, to get this coordinated statement first. But I think the important thing is that the start was made.

I believe we have brought most of the facts out on the table; I think we have the issues out on the table, and now it is for us to get this together.

Again, let me say this before we turn this back to the States. We would appreciate any information we can get, and the more in advance we can get it, the better it is going to be. This includes the citizens, the industries, the municipalities, the citizens groups, the power company. But please try to relate this to the facts and the issues as they came out here and try to make this an analysis of those facts and issues.

This is your chance to make a contribution. Because if there is anything wrong in here, goodness knows we don't want to base anything on something that is wrong and make a false step.

I think what I am asking you -- I am holding my hand out to you -- is that in the next month you look this over very, very carefully and try to assist us in getting the program going. Perhaps in early January we will be able to come up with a program which will enable us to move forward.

Are there any questions or comments from the conferees?

(No response.)

Let me again summarize. Is it you or your region, Mr. Pahren, that is going to set up the technical committee? Will you be the man?

MR. PAHREN: The region will set it up. In fact, I think we ought to go up to the room right now and set it up.

MR. STEIN: Will you be the man responsible?

MR. PAHREN: Yes.

MR. STEIN: Mr. Pahren will be responsible for setting up this technical committee. We will have a report from the technical committee in the hands of the conferees by December 30. We will reconvene in Providence at a place to be announced on the 6th to hear any public testimony or industry or municipal testimony on a specific analysis. As soon as possible after that the conferees will go into executive session and come up with their report.

In addition to that, if we get any information that is pertinent from the technical committee that they believe should be made public, that will be made public at that time too.

I would like to thank you all very much.

We stand recessed.

(Whereupon, at 4:05 p.m., the conference was recessed, to be reconvened in Providence, Rhode Island, at a time and place to be announced, on January 6, 1972.)

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